THE IRON-TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. FEBRUARY 16, 1899. CHICAGO, ILL. NUMBER 7

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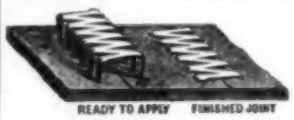

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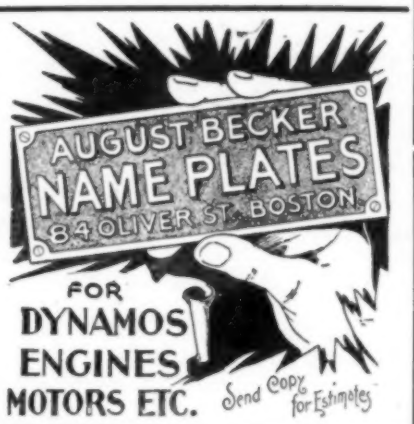

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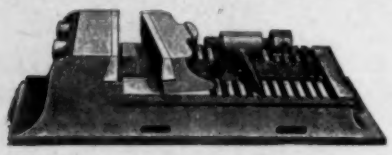

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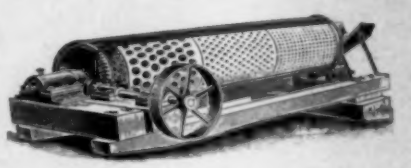

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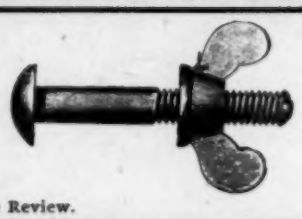

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. FEBRUARY 16, 1899. CHICAGO, ILL. NUMBER 7

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron trade has had a week of quiet from great consolidation rumors such as were rife ten days ago; but progress has been made on the movements which have been referred to from time to time in this column as likely to result in further concentration of the industry. The National Steel Co., whose incorporation was noted last week, has only $100,000 capital thus far, the charter being taken to preempt the name. The gathering in of the various Central Western steel companies will require time and the capitalization will expand as needed. It is now evident that little short of a financial or industrial cataclysm can stop the advance of prices on iron and steel products. In view of the steady tightening of the market in the ordinarily quiet weeks of midwinter, it is becoming more and more a question where material will come from and to what length prices will go, under the demand expected on all hands with the opening of the season of activity. In pig iron and in the majority of finished lines producers are so far sold ahead that the trade could quite well run on for the next three months, on specifications and shipping orders—for four or five months in some cases. For two weeks in succession, now, fresh advances have been made in more than half a dozen leading products, including pig iron, steel, plates, sheets and bars. Last week, in addition to these, rails were advanced $2 to $3 a ton, and wire nails, $2; and this week wrought pipe is added to the list. While the severe weather has limited production at every blast furnace and steel works in the country in the past week, it has not stayed the demand for iron and steel, of which the mails of selling companies are giving even uncomfortable evidence. Pig iron production was about 1,000 tons a week greater on Feb. 1 than at the beginning of the year; and the January decrease in stocks was 35,000 tons, leaving a total of 473,000 tons, or less than a two weeks' supply. In the East pig iron has advanced 50 cents in the week, making No. 2 X $12 at Philadelphia. At Chicago, local iron is 50 to 75 cents below Southern, and Central Western producers, even with recent advances, are still much below delivered prices for Alabama iron. It is evident that at the present pace of increase in foundry operation some consumers of foundry irons will have difficulty in getting iron before the summer comes. Some Southern furnaces are now face to face with shortages on scheduled deliveries. In Bessemer iron the $11 price at valley furnace has been established. Sales could be made for third quarter delivery; but in every department of the trade, wiht the exception of iron ore, foundry iron, rails, and to a small extent, a few other products, the second half of the year is still kept a closed book. Buyers of steel billets and of rolled products would contract at to-day's figures or, even a slight advance, for late deliveries, but sellers will not speculate on the future, particularly as all indications point to a distinctly higher level for the third quarter. It is noteworthy that bars, which have been the last to rise, are now getting step with the general movement. Steel is higher than iron, and the latter, which has been displaced by steel in the past two years because steel was cheaper, will now come into larger use. Plate mills are simply overwhelmed with work, and new capacity will not afford any relief for months. The common quotation, where business can be considered, is 1.50c to 1.55c Pittsburg for tank, and 1.70c Cleveland has been done. Sheets are from $1 to $2 higher in the week and deliveries are restricted to the next two or three months by most sellers. The wrought pipe advance is moderate, considering the surprisingly heavy movement for winter months. Chicago reports considerable new tonnage in ship plates, structural material and bars. There is a deal of figuring about the lakes on vessels for next year, but the strong advances in material cause some hesitation, though it is admitted that higher prices will doubtless be paid at the end of the year.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Feb. 15

The record breaking cold weather of the past week has seriously affected the iron market in several ways. The mills have never before been so crippled on account of cold, and production has been curtailed to a greater extent than the demand, so that the tension this week is greater than last. The Pittsburg district has been practically isolated from the East, and mails all around have been light. Last Friday the Pennsylvania Railroad announced that it would not receive freight for shipment out of Pittsburg, and very little iron and steel has been moved in any direction for about a week. The scarcity of raw material was accentuated by a serious break in the engine at the Bellaire steel plant late last week. In all lines there is a firmer feeling, and in pig iron, steel, sheets, skelp, plates, spelter and pipe we quote advances. The feeling is growing that the present advanced prices are not temporary, but are likely to be sustained through the year, and there is no disposition on the part of producers to sell for the third or fourth quarter of the year, notwithstanding offers are being made that would ordinarily be considered most tempting.

PIG IRON.—The Bessemer market is in a strong position, and the quotation of $11, valley, noted last week is strictly adhered to, although for large quantities a higher price might be named. The market in this line is quiet. In foundry iron there is a moderate demand which has further developed the strength of the producer's position, and sales of No. 1 foundry have been made within the past week at $11.35 and even higher, while No. 2 has sold from $10.75 up to above $11 for special brands. In gray forge there has been such a scarcity that in a few isolated cases where the material was urgently required almost fancy prices have been paid. A sale is reported at $11 delivered, Pittsburg. We quote the valley and Pittsburg markets both fully 50 cents higher than last week, and should a genuine demand materialize it is difficult to tell where prices would go. For all lines of pig iron consumers are well covered and this feature may be expected to regulate the market. We quote:

Bessemer, valley furnace	$11.00		
Bessemer, Pittsburg	11.50	to	$11.65
No. 1 Foundry	11.35	to	11.50
No. 2 Foundry	10.75	to	10.90
No. 3 Foundry	10.25	to	10.35
Gray Forge, valley furnace	10.50	to	11.15
Gray Forge, Pittsburg	10.50	to	10.75

STEEL.—The scarcity of steel has been accentuated by the curtailment of production at mills owing to the cold weather, and by preparations to consummate the actual transfer to the National Steel Co. of the plants to be merged in that consolidation, an exclusive account of which appeared in these columns three weeks ago. The number of individual steel producers is again materially reduced, and the outcome will be a much steadier market, following more closely the variations in actual consumptive requirements. The speculative element in the steel market is being rapidly eliminated and the field of the middleman is narrowed even further. The new steel combination will have closely affiliated lines into which much of its product will go in the form of sheet and tin plate bars, while a distribution of specifications among the different plants can be made in such a way that the balance of the steel capacity can readily be made to assume the form of billets. There is only a very moderate inquiry for billets, but the supply is even then inadequate, and the market, as far as it can be quoted in the present excited state, is fully half a dollar a ton above the figures of a week ago, and we now quote $18.50 to $18.75, mill, Pittsburg, Wheeling or valley, with specifications very difficult to place. The prediction is freely made that for the second half of the year the price will average above $20. No steel is offered for delivery beyond July 1. Consumers in many cases would be willing to contract for the balance of the year at present prices. Ordinary open-hearth billets have sold at $24 in the past week. There is no market in sheet bars or wire rods. The sheet bar capacity is now wholly controlled by the National Steel Co., and associated interests, and there will be no market until this company is prepared to sell.

SHEETS.—The sheet market has advanced in the past week at the rapid pace set a few weeks ago, and nothing below 2.10c for No. 28 can now be done, and it is doubtful if a round order could be placed at that figure. Some mills are quoting 2.15c, and nothing can be had beyond July 1. The consolidation of sheet mills has now been pending for some time, and the delay is largely attributed to the fact that those back of the movement have firmly determined to form the consolidation on the most solid and conservative lines. Galvanized iron is likewise much firmer, owing to the higher price of sheets and the marked advance in spelter, and nothing below 75 and 10 per cent off can now be done. This is an advance of exactly one-fourth above the quotation of 80 and 10, which was the market the latter part of November.

RAILS AND TRACK MATERIAL.—There have been no changes in rail prices since the advance chronicled last week. The price is $22 for large lots and $1 more for carloads and up to 100 tons, for standard sections, with $25 up for light rails. In track material there is a very good demand, and spikes and links and pins are $1 a ton higher. We now quote: Spikes, 1.50c; track bolts, 1 65c to 1.70c; splice bars, 1.10c to 1.15c; links and pins are quoted from 1.35c to 1.40c.

STRUCTURAL MATERIAL.—There is a good demand for the time of year for structural material. Prices remain unaltered, and we quote: Beams and channels, 3 to 15 inches, 1.30c; 18 to 24 inches, 1.40c; tees, 1.35c; zees, 1 30c, and angles, 1.20c.

PLATES.—The plate mills are still pressed with business. It is not so much a question of price as a matter of getting supplies. Consumers are willing to pay nearly any figure for immediate shipments. Users of plates who are bidding on new work are sending in 50-word telegrams explaining their wants, and some good orders are being turned down simply because the mills are full. An instance cited is one order for 1,000 tons, June and July delivery, which could not be accepted. Matters are made worse by the cold weather interfering with mill operations. Prices continue to advance and quotations this week show tank plate at 1.50c to 1.55c; shell, 1.60c; flange, 1.65c; fire box, 2c and upward.

SPELTER.—This market is stronger than ever, and prices are still going up. This week the local quotation is 6.25c; New York, 6.30c; and St. Louis, 6.10c. There has been quite a jump in high grade zinc ore which is now quoted at $45 per ton, Joplin, Mo. The figure for fancy ores is $1 50 per ton additional.

PIPES AND TUBES.—There has been nothing like a let up in the call for wrought pipe and only a part of the business offered can be taken care of promptly. No little trouble is experienced in securing skelp. As stated last week, conditions were favorable for an advance, and at a meeting held on Friday a jump of five per cent was made in the price of merchant pipe, leaving quotations as follows: Additional discounts:—Five 10s and 2½ for less than carloads with an extra 5 for carloads; base discounts:—Butt weld, black, 55 per cent off; lap weld, black, 65 per cent off; butt weld, galvanized, 45 per cent off; lap weld, galvanized, 50 per cent off. Discounts on merchant boiler tubes are as follows: 1¼-inch to 2½-inch inclusive, 70 per cent off; 2¾-inch and larger, 72½ per cent off, with an extra 5 per cent to dealers. Inserted joint casing is quoted at 60 off and screw and socket joint casing at 60 and 10 per cent off, with an extra 2½ per cent to dealers.

OLD MATERIAL.—There is an increased demand for scrap material, but little has moved during the past week on account of the inclement weather. While there has been no change in prices they are held more firmly. Melting stock, $11.25 to $11.50; old steel rails, long lengths, $10.25 to $10.50; cut, $10.50 to $10.75; old iron rails, $14.50; wrought iron scrap, $11.50, net valley; cast borings, $6, net, valley; busheling scrap, $9, net; car wheels, $10.25, gross; cast scrap, $9, gross; iron axles, $6, net; steel axles, $12.50 gross; charcoal scrap, $10, gross; wrought turnings, $6.75, net, valley.

IRON AND STEEL SKELP.—A more urgent demand for skelp iron and steel is reported this week, and prices are moving upward. The advance in pipe has occasioned a rise in the raw material, and the following prices are now quoted: Grooved iron skelp, 1.15c to 1.20c; sheared iron skelp, 1.30c to 1.32½c; groove steel skelp, 1.10c to 1.12½c; sheared steel skelp, 1.25c to 1.30c.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World*.. 1522 MONADNOCK BLOCK, Feb. 15

The market continues active and strong. Sales of various forms of steel were large last week, and the indications are that they will continue large for some time. Pig iron was quiet, with only fair sales, and it is not expected they will increase immediately.

PIG IRON.—Sales last week were limited in size to comparatively small lots, and the aggregate of orders was not large. The most important sale made was one of 2,000 tons of Southern iron, which went at the full quoted price. In fact, absolutely no iron is being sold in this market at anything under the quoted figures. The furnaces seem to be getting firmer and firmer in their views every week, and are not inclined even to consider offers of business at prices under the schedule given below. Southern furnaces are particularly well sold up and have very little iron for delivery within the next three to six months, and are consequently independent. The local furnaces continue to hold their prices 50 to 75 cents a ton under Southern figures, and are securing the larger part of the business going, as a consequence. It seems to be the policy of the largest local interest to hold quotations at the present basis, rather than to advance them; at the same time the quantity of iron to be had at the present figure is limited, as the furnaces cannot take a great amount of business for delivery within the next six months, and there is no disposition to accept orders for delivery beyond that time. Undoubtedly the market is in such condition at present that much higher prices could be secured for iron if the furnaces desired to ask them. Producers are anxious to be conservative, however, and prefer to keep the present large consumption up rather than to force it to smaller dimensions by making prices too high. There are a number of large inquiries in the market for iron for delivery during the last half of 1899 and the first half of 1900, but furnaces refuse to consider business as far ahead as this, preferring to wait for further developments. The demand for iron for immediate delivery is not large, and can easily be taken care of by the furnaces.

Lake Sup. Charcoal....	$12 50 @ $13 50	Southern Coke No. 3...	$12 50 @ 12 75
Local Coke Fdy. No. 1	12 50 @ 13 00	Southern No. 1 Soft.....	13 00 @ 13 25
Local Coke Fdy. No. 2	12 00 @ 12 50	Southern No. 2 Soft.....	12 75 @ 13 00
Local Coke Fdy. No. 3	11 50 @ 12 00	Southern Silveries.....	12 50 @ 13 00
Local Scotch Fdy. No.1	12 50 @ 13 00	Jackson Co. Silveries..	13 00 @ 13 50
Local Scotch Fdy. No.2	12 00 @ 12 50	Onio Strong Softeners	12 50 @ 13 00
Local Scotch Fdy. No.3	11 50 @ 12 00	Alabama Car Wheel...	15 50 @ 16 50
Southern Coke No. 1...	13 00 @ 13 25	Malleable Bessemer ...	11 50 @ 12 00
Southern Coke No. 2...	12 75 @ 13 00	Coke Bessemer.....	11 50 @ 12 00

BARS.—There has been a large demand for both iron and steel bars in the past week, and considerable sales have been made. Orders have been as large as 3,000 tons. No agri-

cultural implement business has been placed as yet, and it is not likely that this buying will commence before the first of next month, but several inquiries have been received, and these denote an increase in this class of business for the coming year. The market is very firm, and steel bar makers are particularly so, in view of the recent consolidation of the billet makers who are not already included in previous combinations. Common iron is quoted at 1.20c to 1.25c; soft steel bars, 1.20c to 1.25c; guaranteed iron, 1.25c to 1.30c. Some business has been done under these figures, but it was for very favorable specifications and delivery.

Rails and Track Supplies.—Orders last week were not large, for either standard sections or light rails. Some inquiry is had for the latter, and sales are expected to be larger with the later season. The advanced prices are secured in every case. Quotations are as follows: Standard section rails, $23 to $24; light rails, $21 and upwards; steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

Car Orders.—Several small orders were given out, and the sales of car material of all kinds was excellent.

Billets and Rods.—The local mills have closed no business with the exception of a sale of 2,000 tons of axle billets for summer delivery, at the mill's covnenience, at $23. Open hearth billets are quoted at $21.50. Bessemer billets, $19.50; rods, $26.

Structural Material.—Contracts for considerable material were made with the Geo. A. Fuller Co. for buildings which that company will erect in the East. Bridge builders bought about 5,000 tons of material last week, and have inquiries out for as much more. Local small-lot business has been effected by the continued cold weather, and has been light. Quotations are as follows: Beams, 15 inch and under, 1.45c to 1.50c; 18-inch and over, 1.55c to 1.60c; angles 1.35c to 1.40c; sheared plates 1.45c to 1.50c; universal plates 1.55c to 1.60c; tees 1.50c to 1.60c; zees 1.45c to 1.50c. Small lots from stock are quoted at ¼c to ½c higher.

Plates.—The demand continues very large, and mills are unable to take all the business offered. The local mills took orders last week for about 6,800 tons of ship plates for Western delivery during the last half of the year. Considerable other business was also placed. The market is very firm, but no higher. Prices are as follows: Tank plates, 1.45c to 1.55c; flange steel, 1.50c to 1.60c; marine, 1.70c to 1.80c; fire box steel, 2.25c to 5c.

Sheets.—Sales of both black and galvanized sheets were good last week, although the store business in galvanized sheets was hurt by the excessive cold weather. Considerable contracts were placed, and the demand indicates a continuance of the business. Quotations are made at 2c to 2.10c for No. 27 black sheets, and 70, 10 and 5 per cent off for galvanized.

Merchant Steel.—Sales of steel last week were very good, as large, in fact, as the mills desired to accept. The demand continues good, and sales are expected to be large for some time to come. Quotations follow: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.70c; smooth finished tire, 1.50c to 1.60c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

Scrap.—The demand for all kinds of scrap grows larger every week, and sales last week were consequently better. Several good orders for various kinds of material were placed in the week, and a number of large inquiries are still unsatisfied. The demand for cast scrap is particularly good, and the supply is not large.

Old iron rails, gross,	$13 00@$13 50	Axles, net	$14 50@$15 00
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 25@ 4 50
Old steel rails, short	8 50@ 9 00	Wrought turnings, net	6 00@ 6 50
Old wheels, gross	11 75@ 12 25	Axle turnings, net	7 00@ 7 25
Railroad forge, net	11 75@ 12 25	Mixed steel, gross	6 50@ 7 00
Dealer's forge, net	9 50@ 10 00	Stove plates, net	5 75@ 6 00
No. 1 mill, net	7 25@ 8 00	Heavy melting steel, gr.	8 25@ 8 50
Heavy cast, net	9 25@ 9 75	Old iron splice b., net.	12 75@13 00
Malleable cast, net	8 50@ 9 00		

CLEVELAND.

Office of *The Iron Trade Review and Industrial World.*
27 Vincent St., Feb. 15.

The chief feature of the Lake Superior ore market in this mid-February week is that there is no market. It will be substantially 12 months, something less, perhaps, before iron ore sales come to be again a matter of live interest to the trade. The search after non-Bessemer ores is still prosecuted by a few furnacemen who have underestimated the buying movement; and in some instances the question of the source of the next year's mixture has not been satisfactorily solved. In Bessemer ores the condition is not so completely shut up; but it is probable that difficulty would be experienced in getting a 50,000-ton lot. If the regime of alternating feast and famine were still on, in the iron trade, there might be some expectation that furnaceman who have made liberal estimates of their requirements and bought accordingly, would have ore to sell later in the year. Such re-sales have been known in years of bright early prospects that later had their reactions. If they should come this year they will not affect the ore trade, but only help out such furnacemen—and there are some—as have not yet provided for a year's run. The report of the sale of the Franklin mine to the American Steel & Wire Co. is incorrect. The mine has been under option twice recently, but to other parties, and its destination, we are advised, is not yet settled.

Pig Iron.—The market for Bessemer iron is steadily working to a stronger position, notwithstanding some holding up of shipments earlier in the year. The number of furnaces making Bessemer for the market is small. One furnace has recently changed from Bessemer to foundry; two have gone on low phosphorus metal; one Hubbard stack is disabled for 30 days by an explosion early in the week; a furnace counted in the Bessemer arrangement last year is now on basic and likely to stay on non-Bessemer metal. Thus the Bessemer merchant furnaces are fewer than for many months, and their engagements for the first half of the year leave only a moderate amount for sale. But for the evident effort to hold prices down and avoid a boom, it is believed $11.50 to $12 would be ruling to day for Bessemer. A sale of 1,000 tons is reported at $11 at furnace and the Pittsburg freight is full 65 cents. There is no disposition to consider business running beyond the middle of the year and for the next few months trading is expected to be within narrow limits. "Foundry furnaces are slowly but steadily establishing higher prices, though still quite below the figures on Southern iron. The usual basis is now $10.50 for No. 2 foundry at furnace and $11 for No. 1, though some sellers are 25 cents higher. Buyers are in the market week by week, those who contracted six months or a year ago asking prices on their usual requirements for a year or half year. Sellers are booking orders at current prices; though quite assured that, contrary to the history of a number of years, most of the deliveries on such contracts will be below prices ruling at the time. Gray forge is quoted $10.50 to $10 75 valley furnace. Recent sales were at $10.35, and buyers are offering $10.50, bringing gray forge on a level with No. 2 foundry. We quote f. o. b. Cleveland.

Bessemer	$11 65	Valley Scotch No. 1	$11 65
No. 1 Strong Foundry	11 40@11 65	Valley Scotch No. 2	11 15
No. 2 Strong Foundry	10 90@11 15	Gray Forge, valley	10 00@10 25
No. 3 Foundry	10 65@10 90	Lake Superior Charcoal	13 50@13 50

Finished Material.—The effort of certain buyers to get their orders entered for deliveries reaching past the middle of the year is in contrast with the failure of others to specify on contracts in advance of actual consumption, though assured by the sellers that the ability of the mills to furnish material when wanted will be much less than it is to-day. In sheets, bars and pipe there is now such a volume, with the spring demand all ahead, that it is evident deliveries will not be made as wanted, when the usual busy season comes on. Plate mills are turning away business daily, and are refusing to name prices on summer deliveries, though asked now to make contracts four to six months ahead. We quote 1.50c, Pittsburg, on tank; on No 8 gauge 1.70c, Cleveland has been quoted in the past week. The sheet market is firm on a basis of 2.10c to 2.15c, Cleveland for No. 27, and 2.20c, Cleveland, for No. 28. Business in wrought pipe is unusual for February and the mills are full, with the Spring trade six to eight weeks off. A deal of figuring on vessel material has gone on in the past few weeks, but with little closed through local offices. The fact that on material alone about $20,000 more must be paid on each vessel than contracts would have come to a few months ago, is deterring would-be investors. Bars, both iron and steel, are higher; and now that steel has gone from $2 to $3 a ton above iron it is expected the latter will regain some of the ground it has lost on account of price. We quote bar iron at 1.10c, Cleveland, and steel bars 1.20c. Valley mills quote 1.05c to 1.07½c on iron and are well filled up. Wire and wire products show a well-sustained demand for the time of year, and the mills are making a large output in view of spring trade, the new policy of selling only for immediate delivery keeping them closely in line with actual consumptive demand. We quote wire nails $1.60 base to the jobbing trade, with 5 and 10 cent advances on carload lots and less than carload lots. On wire the present quotations are $1.75 for painted, and $2.15 for galvanized, Cleveland mill.

Old Material.—There is a good movement at firm prices. We quote old iron rails at $14 50, valley mill old steel rails, $9.75 to $10; car wheels, $11; No. 1 wrought scrap, $12; machinery cast, $9; wrought turnings, $7.25; cast borings, $6.25; stove plate, $6.25.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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MAKING STEEL AND MAKING COMBINES.

Mr. Carnegie is a bit satirical on the combination craze, in commenting on the fanciful story that the Carnegie Steel Co. is to be included in a $400,000,000 corporation to take in all the steel plants in sight: "The Carnegie Steel Co. is out of fashion in these days—a back number. We only know how to make and sell steel, and nothing about making securities, preferred and common stocks and bonds." With its splendid organization, its unrivaled equipment and its command of cheap raw materials and of cheap transportation rates, the Carnegie Steel Co. may be expected to continue in the way in which it has traveled for so many years. Its present limited partnership scheme may not be a finality. The same broad-minded policy that has kept it in the van in technical progress may be expected to make such modifications of its plan of organization as new conditions demand. There is every reason to believe that the Carnegie Steel Co. will keep fully apace of all developments in the iron industry that call for new adaptations of corporate policy. The concentration of interests connected with iron manufacture to the extent of control of sources of supply of all raw materials, and, in large measure, of transportation facilities for assembling them at the point of manufacture, is a development of the past two or three years. There is no promise of a reversal of this policy and a return to the regime of a distinct and separate interest each for iron mining, transportation, pig iron manufacture, coke manufacture, and so on. Whether there shall be a further amalgamation, so that the few great steel manufacturers of the country shall in part control the agencies for the distribution of their products, is a question for the future to answer. A railroad outlet to the seaboard, and a line of vessels across the Atlantic, or, when the Nicaragua Canal is completed, to the markets beyond the Pacific, are possibilities of the centralization of producing and distributing agencies, that really go but a few steps beyond actual conditions in the iron and steel trade. In the case of the anthracite coal trade, the control of railroads for the distribution of product is already exemplified. Unlike the iron trade, that industry does not require "assembling" facilities.

It is plain that large aggregations of capital will be the rule in the iron trade of the future. The principal difference between given companies in respect to capitalization will be that one will belong to the class whose capital represents tangible value and good will, and another will be a palpable example of the modern method of "preferred and common," and promotion by addition and dilution. The Carnegie Steel Co. has been unique thus far among the large concerns in the iron trade; yet it would not be surprising if the larger control of all that precedes the finished product, including transportation, which it no doubt contemplates, should result in considerably increased capital. And with the eventual introduction of new elements the partnership form would no doubt be succeeded by the corporation. But it would be difficult to think of the Carnegie Steel Co., with any of the modern trappings of preferred and common stock or bonds, and it is safe to say that any such scheme as the daily press has been outlining recently will be long deferred. There are some other iron and steel manufacturers who are quite as unsophisticated as Mr. Carnegie declares himself to be, in the technique of the new corporate type. But not being up to the modern measure in size and in command of raw materials, and therefore apt to be dwarfed by the new race of giants, they are choosing to part altogether with their interests and hand them over to the control of capital willing to pay them a retiring price. It does not appear, however, that the making of steel, as a branch of high modern art, is to give way before the maker of underwritten enterprises. When the craze in the latter industry has subsided somewhat, it will be quite evident, we opine, that knowing "how to make and to sell steel" is an asset whose value will not depreciate, whatever happens to any of the various securities that are now keeping printing presses busy.

A YEAR'S EXPORTS OF IRON AND STEEL.

The exhibit of the shipments of iron and steel from the United States to foreign markets in the calendar year 1898 fully sustains all the predictions as to its extent, that have been made from time to time. We give below the figures for pig iron and various rolled products, and with them the exports in the same lines in 1896 and 1897. It will be noted that the tonnage for 1898 was 420 per cent of that for 1896, which was only about one-third that for 1897. The pig iron total last year was slightly less than that for 1897; but rails made a great gain, as did steel billets, wire rods, sheets, wire and nails. Pipes and fittings, of the value of $4,595,451, in 1898, are not included in the tables, no statistics being given in tons. Nor is the large volume of machinery exports, agricultural implements, car wheels, cars and vehicles, including bicycles, represented in the table below. If this tonnage could

be added we have no doubt the total iron and steel export of 1898 would be the full equivalent of 1,200,000 tons of pig iron:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	December.		Jan.—Dec		
	1897.	1898.	1896.	1897.	1898.
Pig iron { ferro	533	16 }	62,071	5,185	3,700
Pig iron { all other	25,651	31,561 }		257,501	249,377
Scrap	4,126	4,661	1,290	42,469	73,944
Bar iron	312	1,105	3,505	4,493	7,074
Steel bars (not wire rods)	1,111	4,153	8,600	39,165	24,195
Iron rails	100	5,363	618	5,413	10,865
Steel rails	14,118	14,692	72,503	142,787	291,038
Billets, ingots and blooms	2,036	7,430	*	6,356	28,600
Hoop, band and scroll iron	126	493	265	1,424	1,593
Wire rods	501	1,074	*	10,261	18,510
Iron sheets and plates	132	810	771	1,045	4,555
Steel sheets and plates	1,116	3,186	1,850	5,816	27,075
Tin plates, terne plates, and tagger's tin	2	11	†	†2	46
Structural material	2,031	2,252	*	*15,072	34,038
Wire	4,566	7,000	38,043	53,297	74,691
Cut nails	105	578	10,588	14,127	15,735
Wire nails	433	1,573 }	10,225	5,791	13,714 }
Other, including tacks	126	273 }		3,167	2,791 }
	57,125	86,201	210,339	613,374	880,844

(*) Not separately stated prior to July, 1897.
(†) " " " " " Dec., 1897.

The total value of all manufactures of iron and steel in 1898, leaving out implements, cars, carriages and bicycles, was $82,774,958, as against $62,737,250 in 1897 and $48,670,218 in 1896.

SCRUTATOR'S NOTES.

Since writing my "Philippic" against the concentration of the machinery trade, I have been called three or four hundred miles to sell one of my machines that an agent was trying to sell. Why did they call on me to come three or four hundred miles when the agent was on the ground? Was it because I am better looking than the agent? or because I would give them a better price than the agent? or because I was a personal friend of the buyer? Nothing of the sort. Simply because the buyer wanted to ask a lot of questions regarding the machine, which, in the very nature of the case I, being the designer and maker of the machine, could answer better than the agent. In fact the agent couldn't answer them at all. Not that I am any more capable than the agent; but in the *very* nature of things I must know more about my own machine than an agent who is trying to sell a "complete shop equipment" can possibly know. One man, no matter how capable, cannot know *all* the points regarding 20 or 30 distinct classes of machinery, and as this is an age of specialties, I am still of the opinion that the making and selling of machinery will not be "divorced," as the editor of this paper calls it—that is, not in the long run.

***

I wrote some time since, trying to show what seemed to me to be the disadvantage of relatives being associated together in business. I have just been on a trip, and found two brothers, who had been for several years in partnership, had dissolved and started two separate establishments. Each one claimed that there had been no special trouble, but simply that "it was better for brothers not to be partners."

When I wrote before I said that I knew of one case only, in which everything seemed to go smoothly, where the proprietor's son was directly connected with the business. The other day the son came in and, getting confidential, remarked that "a young man makes a big mistake when he goes to work for his father."

This is a delicate subject, and I will stop before I get myself further disliked, only saying that the incidents mentioned in this letter are strictly true, not made up for the occasion, and both have occurred within two weeks. SCRUTATOR.

THE notion seems to be entertained here and there in the British iron trade—the wish is father to it, doubtless—that not much will be heard of competition in pig iron from the United States for some time. The fact that less Alabama iron went into Great Britain in 1898 than in 1897, is cited as foundation for the belief, the effect of the Cuban war and the high freights caused by the glut of ocean trade that followed it, being reckoned as though a permanent, instead of a transient, factor. The London *Iron and Coal Trades Review* says there is probably less likelihood of large imports of Alabama iron into Great Britain while the home demand for American iron is so enormous, but correctly adds that "it is unsafe and unwise to assume that this competition has been got rid of, or is likely to be greatly minimized, even by a serious boom in the United States' demands." It apparently takes a deal of drilling into the minds of many in the British iron trade that the American campaign for foreign iron markets was not a holiday undertaking, and is not to be abandoned on the first appearance of remunerative prices at home. Our London contemporary sees this, and in commenting on the marvelous deposits of cheaply won iron ore and coal in the Birmingham district, says "it is not to be wondered at that Southern manufacturers look upon Alabama as a locality which is likely to dominate a great part of the world in years to come." It closes with several interesting facts and a suggestion:

The economy in the manufacture of Alabama pig iron during the last 20 years has been attributed by Mr. James Bowron to (1) washing the ores, so that less silica enters the furnace; (2) washing the coke, so that it also has less silica and requires less flux; (3) to increased pressure of blast—from 4 or 5 to 12 and 16 lbs —whereby the daily output per furnace has been increased from 45 to 250 tons within 20 years. Is it not possible for British iron-makers to borrow some ideas from this experience that would help them to face the keen competition which it has been so largely instrumental in bringing about?

A Radiator Consolidation.

A "greater" American Radiator Co. has been formed within the past week. Organized in 1892, this company has been for some time doing half the radiator business of the country. To meet the increase in business a new organization with increase of capital was proposed, together with the purchase of other plants. The new American Radiator Co. has therefore purchased the plants of the Standard Radiator Co., of Buffalo, the Titusville Iron Co., of Titusville, Pa., and the St. Louis Radiator Co., of St. Louis, Mo. The new company has authorized the capitalization of preferred stock in the amount of $5,000,000, and of common stock in the same amount. However, $2,000,000 of the preferred stock will remain in the treasury for the further development of the business. The quick assets are $1,600,000. The officers are the same as of the old American Radiator Co.: President, Joseph Bond; vice-presidents, John B. Pierce and Edward A. Sumner; treasurer, Charles H. Hodges; secretary, Clarence M. Wooley. The first board of directors of the new company consists of John B. Pierce, Buffalo, Edward A. Sumner, Detroit; Clarence Carpenter, Detroit; John Fertig, Titusville, Pa.; E. W. Meddaugh, Detroit; George W. Parker, St. Louis; Joseph Bond, Chicago; Clarence M. Wooley, Chicago; Charles H. Hodges, Chicago; John L. McKinney, Titusville, Pa.; Frank O. Lowden, Chicago; W. S. Russel, Detroit; Henry Bond, Buffalo; William T. Baker, Chicago; William H. Hill, East Orange, N. J.

A QUESTION OF TIN PLATE MILL WAGES.

An interesting point has been raised by the officials of the Amalgamated Association in regard to the possibility of an advance in wages for the tin plate workers by virtue of the fact that the scale now in force is a sliding scale, a point that has almost been forgotten because the steadily declining price of tin plate has prevented the possibility of the sliding feature becoming operative. Originally both the tin plate and sheet scales were based, as were all iron and steel scales, on the selling price of bar iron. Up to June 30, 1895, both the sheet and tin mill scales were based on a one-and-a-half cent card for bar iron, the base rates in the scale being paid when bar iron sold for 1½ cents and under, and an advance of 2 per cent being paid for every tenth of a cent at which bar iron sold above 1½ cents. In the conferences to settle the sheet and tin plate scales for the year beginning July 1, 1895, the workers desired to continue the bar iron basis, with a change to 1.1 cents instead of 1½ cents as the base price, so that with 1.2 cent bar iron there would be an advance of 2 per cent, and so on. The manufacturers, however, insisted on basing the wages on the selling price of sheets and tin plates respectively, and gained their point. In the sheet scale, the base was made 2.5 cents for the average selling price of Nos. 26, 27 and 28. In the tin plate scale a clause was introduced which evidently contemplated that the base wages should be paid as long as the selling price of tin plate per box was not more than one-fourth the selling price of billets per ton, but which left it in doubt to what ratio the $2 advance was to be applied. In 1896 the ratio was changed to one-fifth, and in 1897 the paragraph was re-written so that its meaning would be less obscure. It now stands as follows:

"When 100 lbs. I. C. tin plate is selling at a ratio of one-fifth (1-5) the price per ton of 2,240 lbs. of 4x4 steel billets, the wage list as given below shall be paid, but in case of a departure in either the selling price of steel billets per ton or 20 boxes of 100 lbs. I. C. tin plate, that will change the above ratio $2 per ton or more, then the wage list shall advance two (2) per cent for each $2 from said ratio and decline two (2) per cent for each $2 decline to said ratio. It is understood that the list of wages given below is the minimum for the year beginning July 1, 1898, and ending June 30, 1899."

With the advances which have been made in tin plate lately, it seemed possible that the sliding feature of the tin plate scale might now come into effect, and President T. J. Schaffer, of the Amalgamated Association, with some of the other officials, went to Chicago last week to have a conference with the American Tin Plate Co. on the subject. They remained until the end of the week, but no conference could be held on account of the absence from the city of President D. G. Reid and First Vice-president. W. B. Leeds. The matter will be taken up later.

A peculiar feature of the situation is that the sliding scale was based on the selling price of steel billets because it was considered that this was the principal item of raw material which would affect the cost of making tin plate. It is a fact, however, that the present advance in tin plate is due more to the advance in the price of pig iron than to any other cause. Since the beginning of 1898 pig tin has advanced about 11 cents a pound, increasing the cost of making tin plate by 26 or 27 cents, while billets have advanced about $2 a ton, increasing the cost by only about 11 cents a box. The proper interpretation of the sliding scale clause is not yet determined.

THE Virginia Coal & Iron Co., which is to buy various furnaces along the line of the Norfolk & Western road, has elected the following officers for the first year: George L. Carter, of Pulaski, president; Melville D. Chapman, of New York, vice-president; John H. Shieff, of Pulaski, secretary and treasurer. The charter, just filed at Pulaski, Va., provides that the capital stock shall not be less than $500,000 nor more than $10,000,000, divided into shares of the par value of $100 each. The board of directors are George L. Carter, Pulaski; Benjamin L. Dulaney, Bristol, Tenn.; Elverton R. Chauman, Melville D. Chapman and Casper H. Hicks, of New York.

SINCE the decision and publication of notice by the Illinois Steel Co. to pay and retire on May 3d, 1899, the bonds of the company, aggregating $6,200,000, dated Jan. 1, 1890, payable Jan. 1, 1910, unless sooner retired as provided therein, the company has decided and hereby offers to waive for the present the right to retire such of the bonds as shall on or before May 3, 1899, be presented for indorsement, or stamp thereon the following provision: "For a valuable consideration, the holder and owner of this bond and coupons attached permanently waives the right to exchange the same for capital stock of the Illinois Steel Co." Bonds may be presented to be so endorsed, at any time before May 3.

GAS ENGINES USING BLAST FURNACE GAS.

TO THE EDITOR:

In your issue of Jan. 26, on page 6, the extract from the letter from Belgium of your correspondent J. H. Cremer, stated that the large gas engine using blast furnace gas at the Cockerill works at Seraing is of 500 h. p. As this is a matter of much importance to the iron interests, it may be well to call attention to the fact that this engine is of much less power. The following figures apply to it:

Diameter of cylinder,	31.5 inches.
Stroke,	39 4 inches.
Revolutions,	105 per minute.
Effective horse power,	200.

At the trial of this engine there was 181 h. p. developed; that is, the engine was loaded to 181 h. p. and under this condition about a tenth of the possible admissions were prevented by the governor, the machine being one of those using what is best known as the Otto cycle. The gas consumption was about 117 cubic feet per horse power. It is hardly correct to say that the gas is used without cleaning, because in its passage through the large settling chambers much of the dust is thrown down. A. BEMENT.

Chicago.

We take from the *Engineering News* of Feb. 9 the following comment: "In *The Iron Trade Review* of Jan. 26, there is an extract from a letter from Mr. J. H. Cremer, metallurgical engineer, of Cleveland, O., who has recently visited the Cockerill works, and in it he states that their large furnace gas engine is running with extreme smoothness and steadiness without any appreciable variation in speed. He speaks of it as 'a fine engine of 500 h. p.,' and says its thermal efficiency is rated at from 26 to 28 per cent. It is likely that 500 h. p. is a misprint for 200 h. p., and the high thermal efficiency claimed is almost too much to be credible. Mr. Cremer does not share M. Detreux's doubts as to the availability of gas engines using blast furnace gas for blowing engines, [expressed in an article in *Le Genie Civil*, condensed in *The Iron Trade Review* of Feb. 2]; but, on the contrary, says 'it would be reasonable to believe that such engines are the coming blowing engines for furnaces.' We are inclined to believe that if the gas engine using blast furnace gas is the 'coming' blowing engine, it will be a very long time before it arrives in this country. There is no doubt that the engine at Seraing is running successfully, but we have as yet no data as to the cost of attendance, repairs, etc., nor as to the first cost of the engine and its equipment, all of which are likely to be very high as compared with the corresponding figures for steam engines and boilers."

New Carload Minimum Deferred.

A circular issued by Chairman Gill, of the official classification committee of traffic managers, New York, announces that classification No. 18, which went into effect at the beginning of this month, and increased carload minimums from 24,000 to 30,000 pounds, has been suspended until March 31. This is the result of the protests made by shippers all over the country, many railroad executives agreeing with them that so radical a change should not be made without longer notice.

RUMORS that the Tyler Tube & Pipe Co., of Washington, Pa., would go into a combination, induced W. P. Tyler, president and general manager, to publish a statement in which he says that the Tyler plant will not join any combine, and thus lose its identity. He says that many of the employes have bought their homes with the quasi understanding that the concern would be permanent here, and that he gives some weight to sentiment as well as to business.

THE NATIONAL STEEL CO.

The certificate of incorporation of the National Steel Co., mentioned last week, was filed at Trenton, N. J., on Feb. 8, and is noteworthy for its brevity. The purpose of the company as stated is "to mine, manufacture, buy and sell iron and steel and other articles made therefrom, either wholly or partially." The capital is $100,000 and no more, though it can readily be seen that $50,000,000 of preferred and common might be required for carrying out the plans under way. The incorporators are practically the same as those who incorporated the American Tin Plate Co. James B. Dill, general counsel of the American Tin Plate Co., who filed the certificate, says that it is but preliminary to another, which will come when the deal is more fully developed, and which will enlarge both the capitalization and the powers of the company; that the capitalization might be, from time to time, enlarged by filing additional certificates as the acquisitions of the company should require, rather than by filing a certificate at the outset with an extraordinary amount of authorized capital; that there had been practically completed a combination of certain outside iron and steel interests; but that he did not understand that the new combination was in any way antagonistic either to the Federal Steel Co. or the American Steel & Wire Co., or to the Carnegie interests. Mr. Dill added that the new company looks to the absorption of a large part of the iron and steel producing capacity of the country, but that such a combination would take time and would involve a vast amount of detail. Many of the companies that might be included have not even been approached in the matter.

As indicated in the original article in these columns on Jan. 19, the primary purpose of this consolidation is to strengthen the position of the American Tin Plate Co. While the organizations will be distinct, the control will be in the hands of a common interest. The consummation of the pending deal and of that which looks to a consolidation of sheet mills, would mean such control of the sheet bar supply as would practically limit that which went to tin plate mills to the mills of the American Tin Plate Co., or permit the establishment of such a price on sheet bars as would require outside buyers, should there be any, to maintain a profitable price on tin plate or any other product. This is akin to the policy of the American Steel & Wire Co., by which, it is understood, rods will be sold to plants that hitherto have bought rods from the mills absorbed. But it need not be said that the price in such cases will not be so low as to make buyers of rods dangerous competitors of the American Steel & Wire Co. in wire and nails.

Another movement which is related to the National Steel Co. consolidation, but which has made slower progress, is the amalgamation of the sheet mills of the Central West. These in a few cases have their own steel supply, but for the most part are buyers of sheet bars. The same interest is back of this movement, also. With the tin plate and sheet mills of the country for consumers, in addition to two modern bar mills—the Union Iron & Steel Co.'s at Youngstown, O., and the Aetna-Standard Iron & Steel Co.'s at Mingo Junction, O., the National Steel Co. would have an outlet of its own for the bulk of its steel product. But apart from these there need be no question as to the market for all the steel it can produce. Bessemer steel capacity will not go begging for employment, for a long time to come, from all present appearances.

In addition to the plants heretofore mentioned, as under option to the promoters of the National Steel Co.,—namely the Ohio Steel Co., Shenango Valley Steel Co., Buhl Steel Co., Aetna-Standard Iron & Steel Co., King, Gilbert & Warner, and Bellaire Steel Co., –the Wheeling Steel & Iron Co., of Wheeling, and the Midland Steel Co. of Muncie, Ind., have been discussed. The Union Iron & Steel Co., which is a large producer of bars, hoops, and other finished products, and is closely related to the Ohio Steel Co., is also under option. A rumor was current last week that the National Steel Co. was securing the Oliver share in the Oliver Iron Mining Co. and the Oliver coke interests. We are officially advised that no such acquisition has been made, and that no negotiations are being conducted in that direction. The Rosena Furnace at New Castle, which was not sold to the American Steel & Wire Co., when the Edith Furnace in Allegheny was acquired, is consuming about half the Oliver portion of the Oliver Mining Co.'s ore, and the erection of another furnace by the Oliver-Snyder interests to consume the balance is regarded as probable.

The Cincinnati Iron Market.

Feb. 14.

The past week, marked with below zero weather as far south as Memphis, was one of such severity in Alabama as to greatly interrupt mining operations. Labor in the South is not accustomed to extreme cold weather and it is difficult under such conditions to make it efficient. The effect of the cold spell has been to cut production sharply, at least two furnaces having been obliged to bank. This does not help matters at all; for without mincing words, local sales agents report a genuine shortage of pig iron in the South. The furnaces have contracted to deliver more than can be supplied and any interruption to production is in consequence a serious matter. There are still large inquiries, but the only iron that can be offered is for delivery beyond July and some heavy sales of this character have been made. Considering the cold weather, shipments have been satisfactory. Iron is practically being loaded hot from the cast houses into cars, as all the available furnace stocks have been exhausted. One of the large furnace companies in Birmingham has less than 100 tons of iron in its yard. The largest of all the companies that has frequently carried a stock in excess of 100,000 tons has now no stock on hand at all, except a little iron at a furnace that is not as favorably situated for shipping as those directly in the Birmingham district. Matthew Addy & Co. say: "There is no doubt at all but that as the season progresses the shortage of Southern pig iron is going to be even more in evidence than it is now, and already sellers who have contracted to deliver iron at fixed times and who have found it impossible to make deliveries as promised are being fairly driven distracted by the demands of their customers upon them. What may be expected shortly can be imagined, but from the sellers' standpoint as well as from the buyer's the prospect ahead is not pleasant." Rogers, Brown & Co.'s weekly review makes this comment: "There are no speculators in the market; business seems to be entirely legitimate, inquiries coming from manufacturers desiring to cover for their legitimate wants and requirements. Under such circumstances, it is but natural that producers of pig iron should endeavor to secure a remunerative price for their product. The advance in non Bessemer Lake Superior ores averages about 10 per cent over last year. The scale of wages paid in the South at the furnaces, is based upon the price of iron. Prices having advanced as they have, wages must necessarily be advanced, so that the appreciation in values of iron means betterment of the condition of mechanics and laborers at furnaces, especially in the South This in turn adds to the buying facilities of the employes, which in a measure contributes to the general welfare."

We quote for cash f. o. b. cars Cincinnati: Southern coke, No. 1 foundry, $12.25; No. 2, $12; No. 3, $11.50; No. 4 and gray forge, $10.75 to $11; mottled, $10.75; No. 1 soft, $12 25; No. 2, $12; Hanging Rock, charcoal, No. 1, $15.50 to $16; Jackson Co silvery No. 1 $12.75 to $13.25; standard Georgia car wheel, $14 75 to $15 75; Lake Superior charcoal, $14.25 to $14.75.

Personal.

H. P. Crowell, vice-president of the Cleveland Foundry Co., Cleveland, was elected last week president of the American Cereal Co.

Chas. W. Baker, New York sales agent, formerly of Cleveland; W. B. Dickson, first assistant in the order and shipping department; A. C. Case, credit clerk, and John McLeod, engineer of tests, have become shareholders in the Carnegie Steel Co., Ltd.

Fred. Stow, son of President E. E. Stow, of the Peck, Stow & Wilcox Co., Southington, Conn., has taken charge of the company's edge tool works at Southington, Conn. He has been traveling for the company for several years.

Wallace H. Rowe, manager and Stephen W. Tener, sasistant manager, are in charge of Pittsburg district of the American Steel & Wire Co., operating eight plants, these being Rankin Works, Pittsburg Wire Co., Beaver Falls Works, New Castle Works, Oliver Wire Co., Bessemer Steel plant and Edith Furnace of Oliver & Snyder Steel Co., and the Duncansville mill, bought form the Portage Iron Co., Ltd., last week.

THE CAR BUILDERS' CONSOLIDATION.

It is plain that the railroads will not be without competition on their car contracts, even with the car works consolidation fully consummated. As given last week, the list of companies to be taken up by the American Car & Foundry Co. takes in the Michigan-Peninsular, the Jackson & Woodin, the Missouri Car & Foundry, the Ohio Falls Car, Union Car, the St. Charles, the Wells & French, and the Terre Haute Car companies. The *Railroad Gazette* makes this comment on the situation, as it would exist after the consolidation. It illustrates the differing degrees of freedom from competition exemplified in the combines recently made, varying all the way down from complete control, as seen in two consolidations in the iron trade. It is to be said, however, concerning the *Railroad Gazette's* statement, that the promoters of the car consolidation have explained that the companies in the American Car & Foundry Co. make freight cars almost altogether and passenger cars only in a small way. They add that the specialty with the Pullman and Barney & Smith companies is passenger cars, and as the American Car & Foundry Co. will act as their sole agents, there will be perfect harmony:

"It will be observed that the list of the concerns included in the American Car & Foundry Co. lacks the names of several of the great car-builders. We have a list of 55 going companies building either freight, passenger or street cars—many of them building all kinds. Of these only eight appear in the prospectus of the new company, but these eight built 53 per cent of all the freight cars built outside of the railroad shops last year, and 41 per cent of the passenger cars. Thus, they are a very important part of the car-building industry, but do not control it by a good deal. Among the concerns not included in the consolidation, and each of which built last year over 2,000 freight cars, are Barney & Smith, Haskell & Barker, Pullman's Palace Car Co., the Ensign Co., the South Baltimore Co., the Illinois Car & Equipment Co., and the Buffalo Car Works; and there were several besides these which built over 1,000 freight cars each, and which are not included in the combination. So far as the matter stands now, therefore, the railroad companies need not worry about lack of competition for their car contracts.

"The prospectus suggests net profits of over $4,000,000 a year based on a business of 70 per cent of the capacity of the consolidated concerns. So far as we can ascertain, the freight cars built by them last year amounted to about 62 per cent of their total annual capacity, and the freight car business is far and away the most important part of their total business. Whether or not they will be able to push this up to 70 per cent of their total annual capacity is a matter of conjecture into which we need not enter. There can be no question that the car building business of 1899 will be much greater than it was in 1898, and in 1898 it was better than it had been in any one year since 1890; and perhaps we need not look beyond 1899. It is likely, also, that better prices for freight cars will be obtained in the next year or two than could be got in 1898 or any other recent year; but it seems quite within bounds to say that the new company will have hard sledding to earn seven per cent on $30,000,000 of preferred stock and something else on another $30,000,000 of common. Assuming that it works up to 70 per cent of its annual capacity, it will have to make a profit of from $60 to $70 on each freight car that it builds to earn the assumed $4 000,000 net. The benefits of the consolidation, as pointed out in the prospectus, will be:

"The saving of transportation charges on manufactured product by judicious territorial distribution of orders to plants most convenient for delivery; in a common enjoyment of patents, processes and advantages gained by each of the constituent companies, in the saving of many duplicate officials, including salesmen and traveling expenses; in establishing central finance, accounting, purchasing and engineering departments, reducing the 32 departments now devoted to these purposes to four only; in a great advantage incident to the purchasing of large quantities of material and the convenience and certainty of such supplies being received when required and of the quality desired. The importance of this item will be better appreciated when it is known that over 100,000 carloads of freight will be used annually. The result, to say nothing of the natural growth of the business of the company at home and abroad is expected largely to increase the net profits of the existing business, which, if realized, would increase the dividends upon the common stock to at least seven per cent.

"That many of these benefits will be realized is undoubtedly true, but in the nature of things the consumer will have to get his share of those benefits in the way of lower prices. That is the experience of the modern world even where the aggregation of interests can control the field much more efficiently than it can be controlled in this particular case."

LAKE SUPERIOR IRON MINES.

Bills offering bounties on pig iron manufactured from the ores of their respective States have been introduced in the Legislatures of Minnesota, Wisconsin and Michigan. In Minnesota the discussion is taking up much newspaper space, the articles including two by Dwight E. Woodbridge, of Duluth, in the Minneapolis *Journal*. The first canvasses the question of cost of making pig iron in Minnesota as compared with the cost at Pittsburg, Chicago and other seats of the industry; the second discusses the natural market for Minnesota pig iron. The bill before the Legislature provides for a bounty of 50 cents a ton on all pig iron manufactured in the State from Minnesota ores in the next 10 years. It has been reported favorably in the House and a similar bill is pending in the Senate. A similar bill is before the Legislature of Wisconsin, urged by business men of Ashland, Milwaukee and West Superior. It provides a bounty of 50 cents a ton on pig iron that shall be manufactured by furnaces hereafter erected in Wisconsin, but does not require that Wisconsin ores be used Michigan, not to be outdone, has a bounty bill. It provides a bounty of $1 a ton for five years on pig iron made in Michigan from Michigan ores.

A lease recently filed by W. C. Yawkey to the Commodore Mining Co., Mesabi range, provides for a royalty of 20 cents a ton with a provison that if the price of ore is over $2.75 at Cleveland, every cent over that will increase the royalty one-eighth of a cent. The minimum output of the mine after April 1, 1899, is to be 50,000 tons per year.

A controlling interest in the Security Land & Exploration Co., has been bought by Chester A. Congdon, of Duluth. The Oliver Iron Mining Co has been erroneously connected with this deal. The Security company owns the fee of the Sparta mine on the Mesabi, and also of the Shaw and Towanda mines, neither of which latter is developed. The stock recently purchased has been held by J. T. Hale, the Merritts, R. H. Palmer and Stryker, Manley & Buck.

The Claire mine, near Crystal Falls, is to be reopened by Oglebay, Norton & Co, with O. C. Davidson, of the Commonwealth Iron Co. in charge.

Details are being arranged for the passing of the lease of the Queen group of mines at Negaunee to the Oliver Iron Mining Co. The Cleveland-Cliffs Iron Co. had an option on the property, but this expired some time ago. The Corrigan, McKinney & Co. lease of the group has some time yet to run, but an arragement has been made by which a new 20-year lease will be executed to the Oliver company. The fee is held by the Breitung and Kauffman interests, each representing one-fourth, while the Arctic Iron Co. has one-half. This latter one-half is divided between E. N. Breitung and the Cleveland-Cliffs Iron Co. The Queen group includes the Queen, Prince of Wales, North and South Buffalo and Blue mines. At present only 200 men are at work.

Standardized Iron Drillings.

Thos. D. West, of Sharpsville, Pa., chairman of the American Foundrymen's Association committee on stardardizing iron drillings, reports that up to Feb. 1, 19 blast furnaces, 17 steel and iron works, 13 colleges, 11 iron foundries, and 10 private laboratories, were using its standards, a description of which and the mode of their preparation, appeared in *The Iron Trade Review* of Nov. 10, 1898. Mr. West is in receipt of many letters referring in high terms to the excellence of the samples the committee is furnishing the trade and to the greater confidence their use insures, in the results of laboratory work on iron.

THE Amalgamated Association has been working for some time for a better observance of Sunday by iron and steel mills. A meeting in furtherance of the movement will be held in Pittsburg, Sunday, Feb. 19, to be addressed by President Shaffer and by Rev. W. C. Webb, of Philadelphia.

Review of the Technical Press.

[Translation, Condensation and Comment expressly for The Iron Trade Review by Dr. Richard Moldenke.]

Special Steels. [*Iron Age*, Feb. 2.]—Mr. J. B. Nau reviews a paper by A. Abraham published in the *Annales des Mines*, in which there is discussed the use of nickel, chromium and silicon in steels. Naturally armor plate receives considerable attention, and the series of experiments culminating in the final supremacy of nickel steel are reviewed. From the figures given one can readily see the great effect of heat treatment on the strength of steels differing but little in their composition. Furthermore the elastic limit of some of these special steels was raised considerably, when compared with their ultimate resistance, by the processes of tempering and annealing. Thus armor plate which fails at 100 000 per square inch has an elastic limit of 57,000 pounds. Add one and a half per cent chromium and this elastic limit goes up to 71,000, and with half as much chromium and two per cent nickel the result is about 80,000 pounds The carbons run about .40, the silicon .18, and manganese .42. Experiments made with nickel-chromium armor plate to learn the effects of hardening and then annealing show that hardening increases the tensile strength, decreases the elongation, but increases the reduction in area, and thus the superiority of this material is shown over the ordinary carbon steel, which cracks without any evidence of good so far as the last named property is concerned. These results are equally patent whether the plates are hammered and rolled, or only rolled. Where over two and a half per cent nickel is used in a steel there is a tendency to crystallize in the center of an ingot which when rolled exhibits properties similar to wrought iron when both are cut across the fibre and then pulled. High nickel steels are easily made, require no special treatment until 25 per cent nickel is reached. A 10 per cent nickel steel is very hard. These steels polish beautifully, do not corrode easily and can be machined readily when not over five per cent nickel. From a series of tests made by the St. Jacques Works in France the following observations are deduced. When carbon is low and nickel is two to five per cent the resistance increases with the nickel. With carbon .50 or more nickel loses its influence. With 10 to 20 per cent nickel the resistance goes up with the nickel. Adding .10 carbon raises the ultimate strength enormously. Thus a 20 per cent nickel steel with .10 carbon pulls at 284,000 pounds per square inch. These steels are brittle, do not harden when over .10 carbon, nor can they be machined, but they forge and roll well. Steels with 20 to 25 per cent nickel have a great elongation and no brittleness, but are not strong. In connection with the study of nickel chromium steels the Imphy works in France made a large number of tests to obtain a suitable metal for shafts, etc. They wanted a metal which forges well and yet is hard enough to allow the temperature to drop somewhat during the hammering without disastrous results. The composition of this metal was carbon, .75; silicon, .50; no sulphur; phosphorus, .013; manganese, .36; nickel, 25.00, and chromium, 2.88. The bulk of the nickel goes in with the charge; the balance, about one-fifth, is added after fusion has taken place. At the end of the heat the ferrochrom is added and then the ferromanganese to deoxidize and recarburize. This metal is not good for casting, as the inherent tendency to crystallize is not corrected by subsequent annealing. In connection with the use of nickel chrom steel for armor plate an extended series of tests was carried out to see if the dead soft varieties of steel could be profitably replaced by this higher grade material. The fact that nickel chrome steel has such a great percentage of elongation and small reduction in area explains why upon testing it the strain, as shown by the flow of material is distributed all over the piece, head and cylindrical part alike. Another series of tests demonstrated the adaptability of this class of steel for making high grade boiler plate. In corrosion tests nickel chrom steel came out ahead of ordinary soft steel also. Nickel steels with more than 25 per cent nickel are very impervious to surface oxidation, the polished pieces remaining in water for some time without the least sign of rust. The material is therefore well adapted to the manufacture of rules. The expansion of a metal for rules—always a troublesome thing—is minimized to the greatest extent by using a 36.1 per cent nickel steel. The silicon steels, of which little is known as yet, are used to a considerable extent in the manufacture of springs. The composition is about 1.20 silicon and 0.30 carbon. After rolling the bars they are annealed, hardened in water at cherry red until the temperature has dropped to 575 degrees F. and then annealed again at a temperature of a flaming wood fire, finally cooling naturally in the air. The elastic limit of this metal is very high, 184,000 pounds per square inch, and the ultimate strength 284,000 pounds. This silicon steel has many useful qualities and should be employed more frequently in the arts than it is.

Judging Rails by Means of Specially Rolled Test Pieces. [*Baumaterialienkunde*, 10-11.]—Mr. H. W. Verhoop of Luettich, describes his method of judging steel rails. The tremendous speed at which rails are turned out to-day makes the question of testing them, heat for heat, a very difficult one, and while great care is taken not to mix the numbers, yet in heating the ingots in the various furnaces the unexpected will often happen. Mr. Verhoop deprecates the selection of rails to represent "blows" of the converter on the ground that the number stamped into it is by no means a guarantee of its correctness, especially as the records of some tests made from pieces cut out of such rails of the same number showed this very conclusively. Furthermore if the rails were stamped correctly there is still the liability of selecting either the very good or the very bad rails and judging the whole shipment by them Mr. Verhoop therefore suggests the following method as better calculated to accomplish the desired result. When pouring every blow into ingots several small blocks about 2.8 x 2.8 x 4.3 inches are obtained, care being taken to have one end properly marked. These blocks are now hammered out to rods 8 inch in diameter without destroying the identification marks. In this way one is sure of reliable samples of each blow which when properly prepared and tested would enable the inspector to reject all bad material and keep the good. This is provided the rails are marked correctly and the test pieces properly prepared. The first can only be accomplished by the most rigid shop discipline, and the last forms the subject of Mr. Verhoop's further studies. As it takes time to work up the sample blocks into proper test pieces a series of tests were carried out on quite a large scale to see if a rolled specimen would not answer just as well, comparatively speaking, as the hammered one. To do this two blocks were cast from each of 373 blows going to make up a rail shipment for the Belgian Colonial Ministry. One block was hammered out as usual, and the other rolled. The regular hardening, bending and drop tests were carried out in addition on the rails themselves. Since the watching of these 373 charges had to be left to subordinates, Mr. Verhoop selected six of them for his personal information. From each of these six blows of the converter there was made a bar for the hardening test, one for the bending test, one bar cut from the rail for an impact test, one bar hammered and one rolled for the tensile test, one specimen each for tensile test purposes taken from the rail made of the second ingot cast at the head, middle and end, the crop ends being removed first. Of all the other blows the same tests were made, omitting only the samples cut from the rail for tensile test purposes, though in some cases a piece was cut from the middle of the rail. The results obtained from these six blows showed conclusively that the rolled specimen was just as serviceable as the hammered one; of the other 367 blows only 20 samples were not very comparable. The tables accompanying the article give the results in detail. The hammered specimens were prepared by heating the special block to a white heat, drawing it out under the steam hammer, then heating to redness and cooling slowly in ashes. The rolled specimen was heated similarly and went through 10 passes, the middle of the bar being taken for the test. The advantage of this system is that a definite value is attained for every blow, the chances for mixing up samples are reduced to a minimum. The inspector can see the samples prepared, and this itself takes little time. The test is in duplicate and the preparation is uniform. In actual practice while both blocks are cast only one is used, the other being reserved in case the results of the first one are not satisfactory. Again a further precaution is taken by reserving a piece cut from the middle of a rail while yet hot and made from the second or third ingot of the blow.

MELTING IRON IN THE CUPOLA.*

BY DR. EDWARD KIRK.

In 1882, we visited the foundry of Daniel E. Paris & Co., West Troy, N. Y. We found the cupola lining in a condition indicating very poor melting and knew they were having some trouble with their iron. Mr. Paris informed us that their foundry had recently burned down and they had moved into the present one, which had for some time before been idle. The boiler and engine were small and they were having some trouble in melting for want of power to drive a Sturtevant blower, which when run at a proper speed was large enough for the cupola. They were also endeavoring to melt up a lot of scrap from their recent fire, and had also procured some of the best brands of No. 1 Pennsylvania irons and Scotch pig to melt with it, but were having some hard castings. He wished to know if we could suggest anything to help them out until they could put in a new engine and boiler, and find some softer pig iron to work up the scraps, and he took us out to look over the works to see what change could be suggested.

We looked over the blower and machinery, which were only those employed in stove mounting and then went into the engine and boiler room, where we found a good-sized engine and boiler and decided that they were large enough to run the blower and all the machinery in the works at the same time. The engineer at once informed us that they were too small and he could not run any of the mounting machinery when the blast was on or pump water into the boiler without reducing the speed of the blower, and he had to fill the boiler and stop the engine for half an hour before putting on the blast to get up steam. We then went into the foundry, where we found a well arranged cupola of 54 inches diameter inside the lining, and learned that they were melting about eight tons of iron each heat; that from four to four and a half hours were required to run off the heat, and they were melting seven pounds of iron to the pound of anthracite coal. The iron melted so slowly that it was difficult to catch four hand-ladles full to pour off a "four-up" before the first ladle-full was too dull to run the work and the iron was sometimes so hard that the plate cracked when taken out of the sand or when knocking off the gates.

We then went upon the scaffold, where we found the coal when charged was not weighed, but measured in a basket and dumped from the basket into the cupola. We afterwards weighed a basket of coal filled as the melter generally filled it, and found it weighed almost twice as much as the melter stated, and with the extra weight of coal in the basket and the extra shovelfuls the melter said he threw in to fill up holes, we concluded that they were melting about three pounds of iron with one of coal, in place of seven to one as claimed by the melter. No slate was used in charging sprews and gates were not weighed, but the weight estimated by counting the shovelfuls, and pig was weighed by counting the pieces, estimating four pieces to the hundred weight. The greater part of the coal when dumped into the cupola from the basket fell directly under the charging door, where it remained; and the greater part of the iron naturally went to the opposite side of the cupola and this uneven charging naturally produced uneven melting.

We pointed out to Mr. Paris that his cupola lining was not glazed in front of the charging door, but was rough and jagged, as linings generally are in cupola stacks, which is an indication that too great a quantity of fuel is being consumed in melting, and that by using less coal better melting would be done. He thought seven to one was very good melting and knew none of the foundries in Troy were doing any better, and did not think iron could be melted sufficiently hot for their work with a greater ratio of iron to fuel than was being consumed in their cupola. But he was getting very poor results in melting, and after a considerable talk he concluded to let us try a heat the following day with less fuel.

The following morning when we went round to have the cupola prepared for a heat we found the matter of less fuel had been talked over be the entire foundry force, and by them condemned. They argued that dull iron had been melted with the quantity of fuel used and could not be poured at all if less fuel were used. It is a curious fact that molders working piece work and losing work every day from dull iron will object to a stranger, or any man whatever but the melter, making any change in the management of the cupola, or, as they term it, experimenting with the cupola. While getting the cupola ready for a heat, the molders came to us at the cupola or in the yard, one after another, and asked us all kinds of questions about melting, and Mr. Paris came also and asked us if we were sure we could melt iron hot enough for their work with less fuel than they were using, also if we had ever done so before; and we found that we would have to be very careful what we said or did, or we would not be permitted to run off a heat.

The melter was an old hand who had melted iron in a number of the foundries in Troy and was considered good. He was very much opposed to having us do any better melting in the cupola than he had done, without a new engine and boiler, which he declared must be put in before anything better could be done. He knew all about it, and to teach this man to melt with less fuel would only be a waste of time, for he would probably in less than a week drift back into the same old rut if not closely watched, and would condemn our way of managing a cupola. So we told Mr. Paris we could teach his foreman to melt in a few days so that he could oversee the work and teach a man to do it in case his melter was sick or quit, and that it would be much better for them than for us to show their melter how to work with less fuel. After consulting the foreman it was decided that we should teach the foreman, and he went on the scaffold with us. He had the cupola made up as we directed, sent to a store and purchased a new slate and arranged a system of mixing and charging the iron so that it would produce an even grade when melted, having had the scales dug out of a pile of rubbish in a corner and cleaned up, and the iron and fuel place conveniently for charging.

After everything had been arranged for the heat we had a little time to spare, and made it a point to see some of the leading molders and explained to them that we had shaped the lining so that the cupola would melt faster and with a little less fuel than they had been using, and make hot iron. We also saw the engineer and informed him that we would charge the cupola in such a way that it would demand less blast, and if he filled his boiler and had a good head of steam on just before putting on the blast, he could run all the machinery required for mounting when the blast was on. These explanations seemed to satisfy everybody, and the foreman was so enthusiastic in learning to melt that we had no further fear of being run out of the works, and were looked upon as the man who understood his business until the heat was all charged into the cupola, when the melter went into the foundry and said to the molders: "Be jabers yez will not pour off to day, boys, for that cupola will not make hot enough iron for yez with all the coal I was after putting in, and that man has left out half of the coal I put up for the heat. Yez may as well go home and save your molds for to-morrow's heat; for yez will not run your work to-day."

From that time until the blast went on we were looked at shyly by all the molders except two, who had seen us melt in other foundries; but the foreman and these two assured them that we understood our business and they would have a good heat, which probably saved us from being driven out, for there was a tough lot of stove-molders in Troy in those days, who considered their rights sacred and that no punishment was too great for any man who encroached upon them.

When the blast was put on the molders gathered round the cupola and watched every tap until the iron came down so hot and fast that the first turn could not handle it and the second turn was called up, and they were all kept on the run until the end of the heat. Getting iron so fast and hot was something the molders had never been used to in that foundry, and a number of them wished to know if we were trying to kill them all by giving them the iron so fast. But all were delighted with getting hot iron to pour off their work and getting through so early.

In this heat we had used considerably more coal than we considered necessary, as we were not familiar with the working of the cupola and desired to be on the safe side and make hot iron, even though the melting was a little slow, which was the case. Two hours were required for the heat, but even this length of time was fully two hours better than they had been doing, and all the machinery required for mounting was

* From a work on Cupola Practice now in press at Philadelphia.

run during the heat without stopping the engine for half an hour to get up steam before putting on the blast.

On the following day we reduced the coal a little more, and on the third day reduced it until we were melting six and a half pounds of iron to one of coal, and the heat was melted in one hour and thirty minutes. This was as fast as the molders could handle the iron; and as we did not consider it safe to melt iron for stove plate with less fuel, although we could have done so, and they did not desire it melted any faster, we made no further attempt to save fuel or reduce time of melting.

The foreman learned very rapidly, and at the end of three days was fully competent to oversee the work, and they had no further trouble in melting or with hard iron, and were able to melt up all the scrap from their recent fire with the brands of pig iron they had on hand, and it was not found necessary to put in a larger engine and boiler to get a sufficient blast, after they had learned how to manage the cupola.

The cause of bad melting in this foundry was plainly indicated to an experienced melter at first glance by the lining in front of and around the charging door, namely, too great a quantity of fuel in the cupola and too small a volume of blast for that fuel. So large a quantity of fuel was charged for a bed that the iron placed upon it did not come within the melting zone, and could not be melted until the surplus fuel burned away and permitted it to settle into the zone. Each charge of fuel to replenish the bed was too heavy, and the greater part of it had to be consumed before the iron placed upon it was permitted to enter the melting zone, and the slow melting was due to the time required in consuming the surplus fuel before the melting could take place. The hard iron in parts of the heat was due to uneven charging, which permitted the scrap at times to be melted by itself and drawn from the cupola without being mixed with melted pig, and the entire mass of iron was hardened by being subjected for a long time to a high degree of heat before it was permitted to enter the melting zone and be melted.

The speed of the blower had been increased to fully double the number of revolutions per minute given in the directions for running it, to increase the volume of blast; but the volume of blast had been decreased in place of being increased, as was supposed it had been by the increase of speed, and the cupola received less blast. We had no means of definitely determining to what extent it was decreased, but from the appearance of the blast in the cupola at different stages of the heat, before and after decreasing the speed of the blower, we concluded that the volume of blast was increased fully one-half by running the engine at its normal speed and reducing the speed of the blower to the number of revolutions given in the directions for running it.

This is one of the cases where the cupola air-gauge in common use would have been of value, for it would have indicated a high pressure of blast before the speed of the engine was increased, and located the trouble at the cupola in place of at the engine.

Blow Holes and Slag Holes.

Replying to a query in the *American Machinist* for means to prevent blow holes in cast boilers for house heating, run on top with flat gates, "M." writes: "I venture the guess that they are not blow holes, in the sense understood by molders. They are, unmistakably, slag holes, and, if examied, in a cavity the size of a pea a piece of slag the size of a pin head will be found in a corner, it being the habit of real slag to throw off gas that forms a clean hole very much larger than itself, and more globular than a blow hole. The location of the holes around the flat gates points to slag; it, being very sticky, will adhere to the mold around the gates, instead of flowing as other dirt will. A flat gate also receives slag more readily than ordinary pouring gates, and they are not easily converted into skim gates. The question then is whittled down to the point, how to keep your ladle free from slag. If poured with newly lined ladles, and early in the heat, the castings would be found free from such blemishes. After a ladle has been used often, slag sticking below the lip will be liberated and flow at the bottom of the stream and cannot be skimmed with a rod."

The Laughlin tin plate plant at Martin's Ferry, O., resumed last week after 10 weeks' idleness.

AMONG THE BLAST FURNACES.

Recent direct advices to the American Iron and Steel Association from the blast furnaces of the country contain interesting information as to improvements, the starting up of new or recently repaired stacks, etc. Some of it has already appeared in these columns; other items are summarized below from the last issue of the *Bulletin:*

The Ætna-Standard Iron & Steel Co., of Bridgeport, O., is adding machinery to its two furnaces at Mingo Junction, which have heretofore had sufficient machinery to operate only one stack at a time. The company expects to have the additions completed by April 1, after which it will operate both furnaces at Mingo Junction.

Of the two new furnaces of the Lorain Steel Co., Lorain, O., one will be ready for blast about March 1 and the other April 1. They will produce about 350 000 tons a year.

The Ohio Steel Co., Youngstown, O., expects to have its two new furnaces ready for operation about Aug. 1. The stacks will be 105 x 23 feet, and therefore the largest in the world

The Thomas Iron Co., of Hokendauqua, Pa., is rebuilding its No. 3 Furnace at Hokendauqua. The No. 9 Furnace at Island Park will be blown in about Feb. 15 and the No. 11 Furnace, at Hellertown, in the near future. The company will not dismantle its two stacks at Alburtis, as reported.

The last ton of charcoal iron made at Pine Grove Furnace has been sold by Means, Kyle & Co., Inc., of Hanging Rock, O. The furnace started in 1827 and was abandoned in 1898.

Richard Heckscher & Sons, of Swedeland, Pa., are now adding new engines, boilers, stoves, etc., to their No. 1 Furnace, and expect to start it in April.

The new furnace of the Union Iron Works, at Buffalo, N. Y., will be blown in in the spring. The furnace is modern and has an estimated annual capacity of 80,000 gross tons.

It is not likely that the Nannie B. Furnace, at Reusens, Va., will ever again make pig iron.

Sharon Furnace, at Sharon, Pa., idle since 1896, may start up in the present year.

The Reading Iron Co., of Reading, Pa., expects to have its new furnace completed in March. Annual capacity, about 75,000 tons.

The Crane Iron Works, of Catasauqua, Pa., which had two of their four furnaces in blast on Dec. 31, 1898, expect to blow in one of the idle stacks in February.

The Tennessee Coal, Iron & Railroad Co. has removed the machinery from its Sewanee Furnace, at Cowan, Tenn., and it will probably not go again.

The idle stack of the two Lebanon Furnaces at Lebanon, Pa., will be remodeled and ready to start up in May.

Aurora Furnace, Wrightsville, Pa., may blow in in 1899.

The Lackawanna Iron & Steel Co., of Scranton, Pa., expects to blow in its North Cornwall Furnace about the middle of February.

Furnaces whose owners report that they will not again make pig iron: Landon Furnace, Chapinville, Conn., charcoal; Detroit Furnace, Detroit, Mich., charcoal; Round Mountain, Ala., Furnace, cold blast charcoal; Leesport Iron Co.'s furnace, Leesport, Pa., built in 1852; Southern Mining Co.'s furnace at Chattanooga, Tenn., built in 1874; Madison Furnace, Rempel, O., charcoal; South Mountain Mining & Iron Co.'s charcoal furnace at Pine Grove, Pa

The Logan Iron & Steel Co., Lewiston, Pa., will blow in its charcoal stack at Greenwood about April 1.

Victoria Furnace Co., of Goshen Bridge, Va., will blow in its furnace about April 1.

The Gadsden-Alabama Furnace, of Gadsden, Ala., may be blown in this year.

A Baltimore paper says that the threatened antagonism between American Tin Plate Co. interests and the National Enameling & Stamping Co., to which the Matthai, Ingram & Co. plant in that city belongs, has been averted; that the National Enameling & Stamping Co. will not manufacture tin plate, and that the American Tin Plate Co. interest will not undertake the manufacture of enamel ware.

The subscriptions to the underwriting of the American Car & Foundry Co. for $15,000,000 closed Friday, Feb. 10, at the office of Poor & Greenough, New York. The subscriptions amounted to over $22,000,000.

MOLDING DEVICE FOR LIGHT WORK.

The rapping of a pattern in a flask is one of the most difficult of foundry operations, since it should be performed with such nicety as shall prevent variations in the size of the castings. It is far from easy to so separate the sand from the pattern that the castings will not be larger than the pattern. If a molder raps a pattern until it moves 1-64 inch each way the mold necessarily will produce castings 1-64 inch larger on each side than the patterns, leaving out of the account any change in the volume of the iron between the fluid and the solidified state. The device designed by the Acme Malleable Iron Works, of Buffalo, N. Y., and shown in the three illustrations is calculated to hold the pattern securely in its place so that it shall be impossible for a molder to enlarge the mold by rapping. In Fig. 1 the invention is shown attached to a gate of patterns with four patterns on the gate. The invention consists of a recessed forging A and forging B, and plug C. The forging B fits tightly into forging A, when in the flask, as shown in Fig. 2. When the molder raps the pattern it causes a slight vibration of the pattern, sufficient to free it from the sand, but does not increase the size of the mold, provided an anti-rap device is used.

IMPROVED LIFTER.

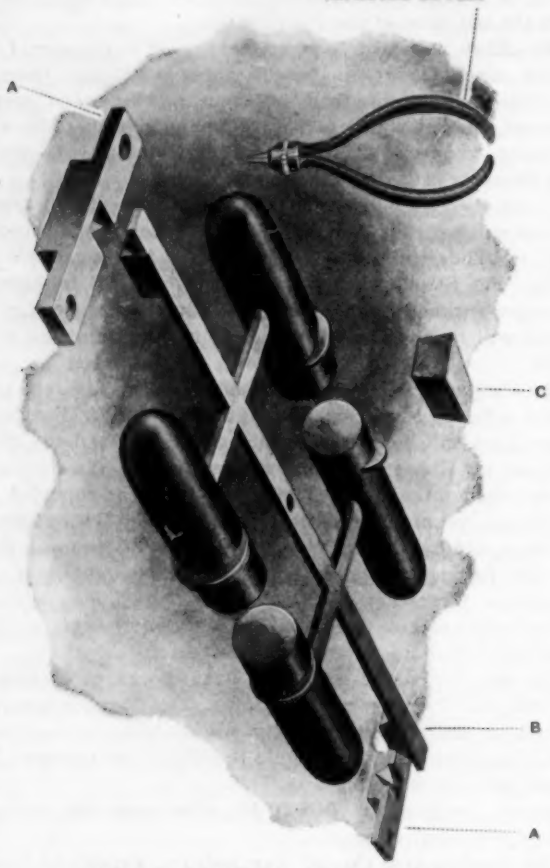


FIG. 1.—IMPROVED MOLDING DEVICE.

FIG. 2.—LIFTING THE PATTERN FROM THE MOLD, USING IMPROVED LIFTER.

In making a mold the first operation is the placing of the pattern in the match. The molder then rams the sand in the nowel with the match on the lower side. Reversing the flask the molder removes the match and substitutes the balance of the flask for the match. Then again follows ramming, and after it the rapping. The best molders cannot rap all molds precisely alike; hence no two molds will be identical in size, notwithstanding they are made from the same pattern. With the improved attachment shown it is claimed that the molder cannot rap the patterns sufficiently to enlarge the mold.

Fig. 2 shows the molder in the act of removing a pattern using the improved lifter as illustrated in both Figs 1 and 2.

FIG. 3.—PLACING THE PLUG OR CHILL.

The wooden plug ordinarily used for lifting must be screwed into the feeder sufficiently tight to permit of lifting the gate of patterns from the mold. The slight recess formed about the pattern by ordinary rapping is made still larger by the use of the wooden plug for a lifter, as it is necessary to press down hard to make the plug grip the feeder. In Fig. 3 the molder is placing a chill at the end of the feeder channel, to prevent the iron from passing out of the mold.

Concerning the cost and utility of this improved method the manufacturers say: "It can readily be seen that the use of this invention necessitates a little more work in making castings, and consequently, it is necessary to charge more per pound for the castings; but, inasmuch as the castings will weigh less per piece than they would if made in the ordinary way, we feel safe in guaranteeing that the castings made by our new process will cost no more per piece than the castings made in the ordinary way. Not only will the castings cost no more per piece, but the saving made on the machining of the castings will be very large. This device can be used only on patterns made in full or full half gates." It is the plan of the Acme Malleable Iron Works to dispose of shop rights for the use of their invention, which applies to light castings of all metals.

IMPROVED TURRET MECHANISM.

L. H. Blood, of Hartford, Conn., has designed an improved turret head and has assigned the patents upon it to the Pratt & Whitney Co. The type of turret mechanism to which the invention applies is that including a turret slide, with rotating turret mounted upon it, and having concentric stop-faces, and a turret-locking bolt with reciprocating movement, the bolt carrying the turret rotating device and arranged so as to engage a fixture on the turret at a predetermined point in one of its movements. The improvement consists in providing in connection with a reciprocatory turret slide and locking bolt, a slide and bolt actuating device comprising two racks which may be shifted together or independently. One of these is secured to the slide and the other to the bolt. Stop devices are provided for controlling the independent movements of the racks, a pinion normally meshing with one of them, and adjusted so that at a certain point in the advancing movement of this rack it also meshes with the other, to impart reciprocatory movements to the bolt and slide and means for rotating the pinion. Fig. 1 is a plan view of a turret mechanism embodying the improvements. It shows

Fig. 1.

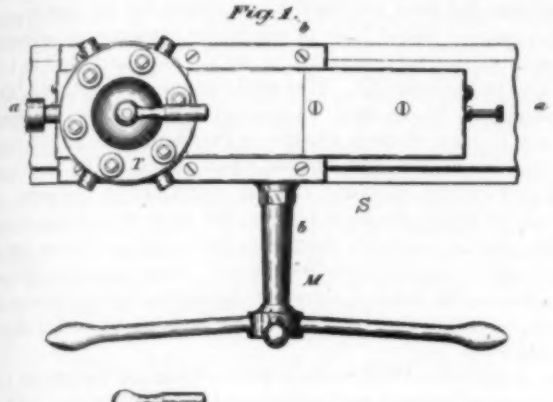


Fig. 2.

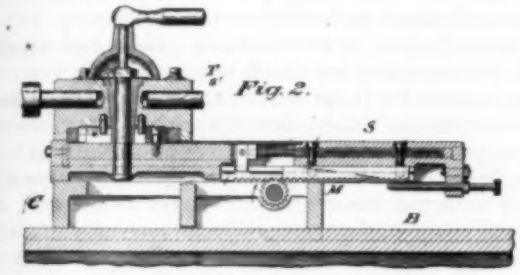
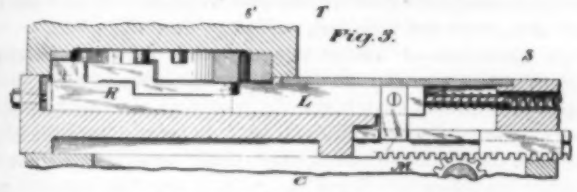


Fig. 3.



the turret, turret-slide, a portion of the turret-slide-supporting carriage, and a portion of the bed of an ordinary turret lathe. A central, vertical section on the line a-a of Fig. 1, indicating the relation of parts is given in Fig. 2, and Fig. 3 is a similar section on an enlarged scale, of a portion of the mechanism. In the latter the turret-locking bolt appears in its fully advanced or turret-locked position.

The parts of the device are indicated in the following: The turret-slide S is supported on a carriage C, mounted in the usual way on the bed B of the supporting frame of the machine proper. The turret T is rotatably supported on the turret-slide and has a circuit of concentrically-disposed lock-notches. The turret-locking device L is supported for reciprocatory movement on the turret-slide at one side of the axis of rotation of the turret, and in position to engage successively the stop-faces of the turret on successive rotative movements. The actuator M co-operatively connects the turret slide and locking device and embodies two racks, better shown in Fig. 3. One of these is fixed to the turret-slide and the other to the locking device, the latter being capable of moving independently of the former, while the pinion imparts reciprocatory movements to the rack. The bolt-actuating rack, most of which, in the position shown in Fig. 3, is to the left of the pinion, is longer than the slide-actuating rack, and the two racks are so disposed relatively to each other and to the pinion that when the turret locking bolt is in its locked position and the slide S is in its fully advanced position, the pinion 36 will mesh with both racks. Then a rotative movement imparted to the shaft of the pinion by the pilot wheel shown in Fig. 1, in the direction of the arrow in Fig. 2, will first draw back the slide and all parts carried by it, in unison. And when the slide has arrived at its fully retracted position, as in Fig. 2, a continued rotation of the pinion in the direction of the arrow, will draw back the bolt-actuating rack and its bolt, independent of the other rack and its connecting slide, the pinion at this time meshing with the former rack. On a reverse rotation of the pinion, when the bolt is fully drawn back and the slide is in the position shown in Fig. 2, the pinion will first operate to advance the rack and shift the bolt into locked engagement with the turret, and will then advance the slide-rack, the slide and the turret.

The device for securing the reciprocatory movements referred to, is one of the chief features of the invention. Other features, which facilitate the rotation of the turret, are also of interest, their general construction being indicated by the sectional views.

COMPRESSED AIR AND "PROMOTERS."

We have been, as we could not have failed to have been, believers in the adaptability and efficiency of compressed air for certain purposes of power storage and transmission. We have been glad to do what we could to spread information concerning it for the purposes for which it is eminently adapted. We have never believed and never represented that compressed air is the best means of power transmission in existence, or that it can ever supplant other means except in the somewhat limited field which especially belongs to it. In shop use, with which we have most to do, it has shown its great value, especially for direct hoisting and for the driving of small por able tools, just as it had previously done in mining, tunneling and submarine work. The field of its usefulness has latterly broadened, until the number of its occupations is legion. A couple of street cars were run for a year upon one of the surface railway lines of this city and gave a most creditable exhibition. A fine power station and a full equipment of compressed-air cars for one of the cross-town lines of the city are now being prepared, and will soon, we hope, be in successful and permanent operation. The air-compressing plant will be much superior to that previously employed, and the motors also will exhibit the beneficial effects of the previously acquired experience, so that the present most strongly entrenched electric systems may not, after all, be the only means of surface traction.

But we are promised an exhibition of the powers of compressed air far more pretentious than this. It is proposing to arise in its might and drive practically all the horses from our streets. The auto-truck is to transform the city. We have a great boom on for compressed air. There is an American Air Power Company with a capital of $7,000,000, an International Air Power Company with a capital also of $7,000 000; a New York Autotruck Company, $10,000,000, and a Chicago Autotruck Company, $10,000,000. Such eminent engineers as Richard Croker and Joseph Leiter are operating the machinery, stock is selling, and its "value" is advancing. Some of it has been quoted above 70; but where is the truck, and what can it do? Where is the first truck, and where is there any promising record of its practical performance? There is a truck which has hauled castings around a factory yard in Worcester, Mass., and that, we are given to understand, is all that there is as yet to show. Two factories are ready to rush out the trucks, but are they yet invented? We are not here implying that they are not; but the question would seem to be a proper one. When stock is for sale the stock buyers should know what they are buying. Do they know in the present case?—[American Machinist.

The association of malleable castings manufacturers who have met in various cities from time to time, the January meeting being at St. Louis, was in session at Muncie, Ind., Feb. 8. A dozen plants were represented. The dispatches in the daily papers found the usual trust as the object of the meeting, but in this case were quite in error.

SOME POINTS ON CAST IRON.

The valuable paper on "Cast Iron," presented by Dr. Richard Moldenke at the November meeting of the Engineers' Society of Western Pennsylvania, has already appeared in these columns. The discussion of the paper as printed in the proceedings of the society raises some interesting questions, and we reproduce it below:

W. A. Bole—Is there any virtue, apart from the cheapening of cost, in the use of scrap iron in a cupola, scrap being said by some founders to assist in making the castings solid. I would also like to have Dr. Moldenke tell us something about the effect of annealing cast iron for softening it.

Dr. Moldenke—As regards scrap iron, a certain amount of scrap is found necessary to get dense enough results, say one-half pig and one-half scrap. If we use too little scrap, the castings will be too open in their crystalline structure. If we use too much scrap, we run into other difficulties, such as excessive shrinkage, internal strains, undue hardness, and the like. The addition of ferro-silicon enables us to use as high as 90 per cent scrap; 40 to 60 per cent will, however, be found better adapted for routine work. What the exact molecular effect is, is not known. I should not advise 90 per cent scrap with 10 per cent ferro-silicon. I have seen castings with round globules of ferro-silicon in them, showing the difficulty of proper mixing. As regards annealing, what kind of annealing do you refer to?

Mr. Bole—I refer to ordinary light foundry work. What do you think about the annealing of small castings and about the annealing of large ones?

Dr. Moldenke—If we take gray iron castings and anneal them too long, it makes them rotten. The best thing to do is to put them in a furnace for, say one or two days, at about 1150 degrees to 1200 degrees. This relieves the casting strains. They should be heated quickly to redness and cooled very slowly. The thinner the casting, the shorter the period of heating, as the oxygen goes through and burns them. I have seen gray castings annealed too long and broken up, which showed a banded structure similar to a many-colored ribbon. As regards malleable iron, I regret that I cannot say as much as I should like to about it, for business reasons.

G. E. Flannigan—Does melted cast iron expand at the moment of solidifying?

Dr. Moldenke—Yes; one can see that from the fine lines of good castings, and wo ld also expect it from the difference between the specific gravities of white and gray iron, the separation of graphite meaning an expansion. To show that iron fills the fixed lines, there may be q oted the example of a grasshopper molded in clay, and then baked until the insect was reduced to ashes; after shaking these out and casting with a fluid hot high phosphorus iron, a perfect model of the grasshopper was obtained. Expanding in settling, on the part of fluid iron, is an undoubted fact, but what happens afterwards is still open to investigation, for it is quite possible that changes in volume occur comparable with the molecular re-arrangement in steel due to recalescence. I have, therefore, suggested a new way of measuring the change taking place, and that is by casting a bar with little arms in it, these revolving mirrors and reflecting beams of light on bromide paper. White iron which has a shrinkage of one-fourth of an inch per foot should give excellent data.

W. E. Garrigues—Do you hold that gases in iron are due in part to absorbed oxygen?

Dr. Moldenke—I won't say exactly. There seem to be two forms of this trouble, one in which the gases are inter-molecular and come out at the moment of solidification; and the other a dissolved oxide. When oxidized iron is tapped, it runs fluid as water, but soon chills. If we attempt to pour it into molds, failure will result. The philosophy of the gas truth seems to be an absorption of a small quantity at first, which if checked by using the iron may be taken care of by proper manipulation. If the iron is subjected to further oxidation, however, it is no longer a question of inter molecular gases, but actual burning. This means dissolved oxide of iron, and disastrous results. When iron is low in silicon, there will be a noted tendency toward gassing. If iron sets too quickly, as the gas cannot escape, and we get blow holes. We should, therefore, run heats as quickly as possible. Whether it is oxygen or nitrogen, or hydrogen that is in the mold, I do not know, but the fact seems patent that a temperature of 2300 degrees F. is not high enough to make all the oxygen combine with carbon and pass off.

Mr. Garrigues—It is difficult to see how carbon can affect the oxygen, and yet not combine with it.

Dr. Moldenke—The fact is shown because in castings we have blow holes.

Mr. Bole—I have watched a ladle full of molten iron in which bubbles rise and burst on top. Is this due to steam from the lining or some kind of internal combustion?

Dr. Moldenke—It is very likely the moisture from the lining of the ladle.

Mr. Phillips—I have a good deal to do with low silicon iron. Have seen it as low as .035 per cent silicon. In the casts it ran .1 to .6 per cent silicon. I have observed a gassing which confirms what Dr. Moldenke has stated. When we began to cast in chills, we got holes as large as hen's eggs, and in breaking up the castings, they sometimes exploded. Percy says he noted cases where the gas burned when the pig iron was broken. We only got these holes when the iron ran low in silicon. When silicon was 7 per cent, we got no holes (in a sister furnace). The darkies who broke up the pigs say they exploded when struck by the hammer.

Mr. Camp—I would like to ask of the presence or absence of gas is not due to temperature only? Gas occluded in iron seems to be entirely CO. It is well known gas in steel is CO; it escapes and burns with its characteristic flame. I noticed this gas in iron from a Duquesne furnace casting chill iron. The fracture of the iron showed small holes, and these were clean and bright, showing that it could not be oxygen. In the use of scrap, we have used 20 per cent steel scrap in our cupolas, taking samples from cupolas every six hours for an entire week. Combustion analysis of these samples showed the carbon to be normal, showing that scrap did not lower the carbon, or rather that the steel was carbonized and changed into pig iron.

Dr. Moldenke—Your result depends upon the length of time the steel is in contact with the incandescent fluid.

Mr. Camp—Cupolas in steel mills run faster than foundry cupolas; 200 to 250 tons per day is usual.

Dr. Moldenke—This is far beyond the ordinary run of work, and the results would hardly be comparable.

Mr. Camp—I do not believe that oxygen can exist in liquid cast iron under normal conditions of temperature. There are too many elements present ready to seize the oxygen. The iron itself, carbon silicon, manganese, all have powerful affinities, increasing with temperature, and under normal conditions of temperature, of good cupola practice, the iron will clear itself of oxygen and resulting oxides.

Dr. Moldenke—I notice you say that the blow-holes you observed had a bright surface. My experience differs. All mine were coated with black oxide of iron, and as I am using low silicon and you high silicon iron, very likely the difference comes in there. You very likely run your cupola at a higher temperature, have more fuel for the steel to pass through, and hence get higher carbon. The maximum carbon thus obtained by direct contact of melted iron with incandescent fluid is about 4 per cent.

Mr. Wilson—In the annealing of cast iron I have made many experiments. Cast iron should not be annealed always. For successful carrying out of some large contracts, the habit of spokes of wheels cracking was avoided by putting them in a furnace and annealing. We produced a sprocket wheel in this way, which formerly gave trouble from the spokes cracking and lost 25 to 50 per cent. After annealing them, we had no cracks (the temperature was 450 degrees), they were taken right from the molds and not allowed to cool off. I would like to know something about cast iron for electrical purposes.

Mr. Bole—I would like to point out the heterogeneous nature of pig iron. Is there not a great deal of ambiguity in analysis? Can a foundryman be certain by having pig iron analyzed whether it is good or not?

Dr. Moldenke—I am sure that he can, for the variation you mentioned can be overcome. When a car load comes in, I have it spread out on the ground in a row, then have the next car spread on top of that, and so on. By drawing from the end, a good arrangement, and taking an analysis of 5,000 tons in this way, the charges would not vary 0 2 per cent of silicon one way or the other. One is very apt to be misled by

buying on fracture. Two kinds of iron can show the same fracture, if cast at suitable temperature.

Mr. Bole—Then the best way to do is to buy five or six brands from five or six makers and mix them.

Dr. Moldenke—Yes; though by using one brand carefully checked up, good results are obtained. I have taken samples of iron from the same car load and got widely ranging silicon results. But, by piling up in the way I stated, the silicon will run very uniformly.

Limestone Consumed by Blast Furnaces in 1898.

The limestone consumed for fluxing purposes by the blast furnaces in the United States in 1897 in the production of 9,652,680 gross tons of pig iron amounted to 4,247,688 gross tons, according to the figures of the American Iron and Steel Association. The *Bulletin* says: "Of this amount, 3,630,666 tons were consumed by the bituminous coal and coke furnaces in the production of 8,464,692 tons of pig iron, 524,271 tons by the anthracite and mixed anthracite and coke furnaces in the production of 932,777 tons, and 42,751 tons by the charcoal furnaces in the production of 255,211 tons. The average consumption of limestone for the whole country per ton of pig iron produced in 1897 was a little over .44 of a ton. The total quantity of limestone similarly consumed in 1898 in the production of 11,773,934 tons of pig iron was 5,275,819 tons, of which 725,729 tons were consumed in producing 1,203,273 tons of pig iron made with anthracite and mixed anthracite coa and coke; 4,502,209 tons were consumed in producing 10,273,911 tons of pig iron made with bituminous coal and coke; and 47,881 tons were consumed in producing 296,750 tons of pig iron made with charcoal. The average consumption of limestone for the whole country per ton of pig iron made in 1898 was almost the same as in 1897, the figures being .448 of a ton, or about .008 of a ton more than in 1897."

Wage Advances Under Consolidation.

The management of the American Steel & Wire Co. announces that on March 1, it will make the following advance in wages. All employes earning up to $1.50 per day, 10 per cent; $1.55 to $2 per day, 7 per cent; $2.05 to $2.50 per day, 5 per cent. It is stated that the advance will mean additional expenditure of between $750,000 and $1,000,000 a year for wages. President Lambert says of this step: "We are making this advance simply because we feel that we can afford it. This company proposes that its employes shall enjoy a fair share of the benefits accruing from its organization by consolidation. We have advanced prices some, the advances varying on different products, but any advance we have made has been warranted by corresponding increases in the prices of ore, pig iron and billets. Everything is on a higher level."

A Pittsburg dispatch says that President Shaffer, of the Amalgamated Association of Iron and Steel Workers, went to Chicago last week to present a requiest for an advance in wages in tin plate mills to take effect at an early date.

Newfoundland Iron Mines Purchased.

The iron ore properties in Newfoundland, owned by the Nova Scotia Steel & Iron Co., have been sold to Henry M. Whitney and associates of the Dominion Coal Co. The ore deposits are of hematite which has been shipped for some time to the Ferrona furnace and mixed with local brown and red hematites. The deposits are located on Belle Island, in Conception Bay, N. F. The island is about eight miles long and is about 35 miles by water from St. Johns. The area of the lower bed is 817½ acres and eight feet thick, yielding an apparent output of more than 28,000,000 tons of ore. The area of the upper bed is 240 acres, six feet thick, equivalent to more than 6,000,000 tons in sight. An estimate of the total deposit is 50,000,000 tons. The ore is easily accessible, and the facilities for shipping excellent. The bay is navigable from eight to nine months in the year. There is a two-mile tramway in operation from the mine to the shipping pier a present capacity of hauling 500 tons of ore every 10 hours. It is expected that the Whitney company will at once equip the property with modern machinery and that a furnace will be built near the Dominion coal mines in Cape Breton.

DRAFT WITHOUT A CHIMNEY.

BY W. B. SNOW.

The days of the chimney are numbered. No longer is the location of the factory to be evidenced by the existence of a tall brick stack belching forth its volumes of smoke. Comparatively small but all powerful is the fan blower which has stepped in to fill its place and do its work. Two years ago at Jamaica Plain in the suburbs of Boston, there stood a tall chimney upon which the B. F. Sturtevant Co. were entirely dependent for producing its draft for the operation of its boilers. Changes in the arrangement of the works necessitated moving the boiler plant, but, of course, it was out of the question to take the chimney along. In its stead a fan blower was installed on top of the boilers and provided with a special engine to drive it at just the speed required. It is automatically regulated so that less than one pound drop in steam pressure greatly increases the draft, starts up the fire and brings the pressure back to where it belongs. It is thus kept the same hour in and hour out, and the fireman has nothing to do but shovel coal.

The fan works by suction, draws the gases from the boiler flue and forces them out through a short stack extending only 31 feet above the boiler room floor. The draft which may be produced is two or three times stronger than that of the chimney which has been discarded. The weather makes no difference, the draft is just as strong on damp and muggy days as on those which are crisp and bright. Though it barely extends above the roof of the surrounding buildings, no trouble whatever is experienced from smoke, for the simple reason that when the draft is produced in this way, no smoke is made. The utter uselessness of the old chimney has been so clearly demonstrated that it has just been taken down for the sake of the bricks it contained. There is thus presented the novel sight of a large manufacturing plant covering a half a dozen acres, with no apparent means for producing the draft, the little steel plate stack being visible from certain points only.

The cost of the entire mechanical draft equipment including the stack has been less than one-half of that of a new chimney. Because of the stronger draft, much cheaper fuel is burned than was possible with the chimney, the saving being nearly a $1,000 a year. In another boiler plant of 1,000 horse power, the full saving is $6,500 per year. At the same time the amount of steam generated in either case may be readily increased to double that for which the boilers are rated. In other words, it is possible with mechanical draft to use much smaller boilers and still produce the required amount of steam.

What has been done here is being done elsewhere. Many boilers on land and sea are now so arranged that a chimney is only needed to carry the gases high enough to conveniently discharge them into the atmosphere. According to the conditions the fan may be supplied for from 20 to 40 per cent of the cost of a chimney. Where the chimney draft is not sufficient, the fan may, for very little cost, be added to help it out. Sometimes the blower can be arranged so as to force the air under the fires, and cause it to pass up through them and thus give perfect combustion; or, on shipboard, it may be so arranged in connection with the ponderous boilers that the air may be heated by the gases as they escape, thereby saving coal. This possible saving of heat is one of the most important advantages of mechanical draft. With a chimney, 20 to 30 per cent has to be wasted in the hot gases in order to produce the draft. The fan requires only about 1-75 as much power to move the same amount of air, and therefore makes it possible to save as much of the remaining heat as is practicable. The fan can be built of any size and exactly adapted to any location, and regulated to suit the requirements. No heavy foundations are required, it seldom requires valuable floor space, and, being portable, need not remain, like the chimney, a monument to departed industry. In every way mechanical draft presents advantages and conveniences which make it perfectly safe to assert that the next generation will see it generally adopted as a substitute for the chimney.

THE daily newspaper report that the plant of the Calumet Iron & Steel Co., at South Chicago, has been sold to the Illinois Steel Co. is officially denied by the latter company. No such purchase has been made nor is it contemplated.

CUBAN IRON ORE OPERATIONS.

The imports of iron ore from Cuba to the United States are expected to be larger for 1899 than for several years preceding, and the trade with England and Germany, in Cuban ores, which was started in 1897, is expected to increase. Of the extent of the iron mining operations in Cuba and the prospects of the various companies, interesting information was given by Jennings S. Cox, Jr., manager of the Spanish-American Iron Co., to Special Commissioner Robert P. Porter who visited the Santiago district in the latter part of last year:

"The only mines at present being worked in the province of Santiago are iron and manganese. Copper mines near the village of Cobre, 12 miles west of the city of Santiago de Cuba, were formerly operated by English companies, and a railroad connected the place with Santiago bay, whence the ore was shipped.

"In order to encourage mining of the ores the crown of Spain issued on April 17, 1883, a royal decree that for 20 years from that date the mining companies should be free from all tax on the surface area of all claims on iron or combustibles; that ores of all classes should be free from all export taxes; that coal brought in by mining companies for use in their work should be free from all import duties; that combustibles should be exempted, as well as iron ore, from the 3 per cent tax on raw materials; that mining and metallurgical companies should be free from all other impost; that for five years mining companies should be exempt from payment of duties on all machinery and materials required for working and transporting ores; that vessels entering in ballast and sailing with ore should pay a duty of 5 cents per ton navigation dues, and that vessels entering with cargo destined for the mining companies should pay $1.30 per ton navigation and port dues on all such cargo, and on the remainder of the cargo as per general tariff. Under this charter the Juragua Iron Co., Ltd., an American corporation owned entirely in the United States, opened mines in Firmeza, built a railroad 20 miles long from that point to La Cruz, in Santiago bay, and, in 1884, shipped the first cargo of iron ore from Cuba.

"The mines of this company were extensively and successfully worked, and, encouraged by this, in 1888 and 1889, two other American corporations, the Spanish-American Iron Co. and the Sigua Iron Co., purchased mines east of these of the Juragua company, and at once began developing them. The Spanish-American Iron Co., incorporated under the laws of West Virginia and owned entirely by American citizens, built a standard gauge railroad from its mines to Daiquiri bay, about 16 miles east of the harbor of Santiago de Cuba. Here the company constructed a steel ore dock of 3,000 tons capacity, a landing pier, buoys, moorings and other improvements to the extent of $500,000. The work of preparing this harbor delayed the opening of the mines for shipment, and it was not until May, 1895, that the first cargo was shipped. The Sigua Iron Co. built a standard gauge railroad nine miles long from its mines to Sigua bay, and there constructed a breakwater and a wooden ore dock. In 1883–84 they shipped four cargoes, about 12,000 tons. Later these mines were closed and during the war between Spain and the Cubans the docks, shops, roundhouse, locomotives and buildings of the company at Sigua bay were entirely destroyed in engagements between the Spanish and Cuban forces.

"The three iron companies mentioned represent an investment of American capital of about $8,000,000, and the two still operating have paid into the Treasury of the United States more than $2 000,000 in import duties on iron ore. Ore outcrops on the side hills and mining is in the nature of quarrying. The following table shows the production of iron ore in the province from 1884 to 1897:

Year.	Juragua.	S. A. I. Co.	Sigua.	Total.
1884	23,997	.....	.....	23,997
1885	80,095	.....	.....	80,095
1886	110,880	.....	.....	110,880
1887	94,810	.....	.....	94,810
1888	204,475	.....	.....	204,475
1889	255,406	.....	.....	255,406
1890	356,060	.....	.....	356,060
1891	261,620	.....	.....	261,620
1892	320,859	.....	.....	320,859
1893	334,341	.....	12,000	346,341
1894	153,650	.....	.....	153,650
1895	302,050	74,991	.....	377,041
1896	291,561	114,110	.....	405,671
1897	246,350	206,029	.....	452,559
Total	3,036,314	395,130	12,000	3,443,444

"Under the present customs arrangements these companies are subject to an import duty on coal and indirectly to a tax on all vessels entering with it. The companies have protested against this tax on these grounds: 'Because the United States in occupying Cuba has respected existing charters, and the royal decree, already referred to, is, in effect, the charter under which these companies operate. Because these privileges were granted them in order to make the mining and shipment of the ore possible, and as the price of ore has fallen to less than 50 per cent of what it formerly brought, in spite of the increased product and improved facilities, it is impossible for these companies to operate if their privileges and immunities are taken from them.'

"Several manganese mines in the province, mostly west of Santiago de Cuba, have been worked in a desultory way and the ore is very high grade. The Penupo Mining Co., an American corporation, has built a branch of the railroad of Santiago de Cuba into its mines, and, although prevented from working during the Spanish-Cuban war, is now opening its mines and preparing to ship extensively. Copper and lead occur in several places in the province, but until proper transportation facilities are provided it is impossible to say whether those can be worked at a profit."

Western Pennsylvania Engineers' Banquet.

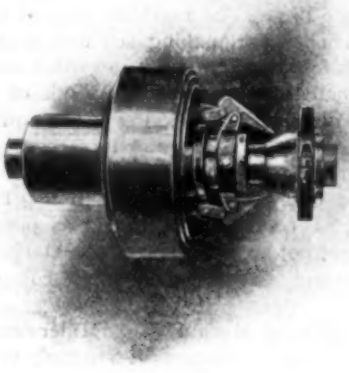
The Engineers' Society of Western Pennsylvania held its annual banquet Thursday evening, Feb. 9, at the new Hotel Schenley, Pittsburg. The tables were in the form of a double E, in the large and handsomely decorated banqueting hall of the hotel, which is located near Schenley Park. The hall and tables were decorated with potted plants, vines and cut flowers. Music was furnished during the evening by Suter's orchestra, and at intervals there was vocal music by a male quartet. Over 200 guests were present, many of whom were non-members. There were very few vacant chairs, notwithstanding the record-breaking cold weather. There was a reception from 8 until about 8:45, when the guests were seated. John A Brashear, the optical instrument maker, was toastmaster. The responses were all roundly applauded, and full of wit and humor. The society has had several brushes with the local municipal authorities and others and the speakers made numerous hits in this direction which were roundly applauded, and deservedly so. W. C Temple was unable to respond to his toast on account of illness. The list of toasts was as follows: "Pittsburg—Our Village," Emil Swensson; "Pittsburg's Blue Sky," W. C. Temple; "Pittsburg's Colonies (from East Pittsburg to Manila)," Wm. A. Bole; "Pittsburg's Future," Victor Beutner; "Pittsburg's Health," W. E. Garrigues; "Pittsburg's Navigation," A. M. Gow; "Pittsburg's Art Center," Daniel Ashworth; "Pittsburg's Good Fellowship," Harry Lewis; "Pittsburg's Ladies," Dr. Wm. B. Phillips. The menu card was rather elaborate, and was beautifully illustrated with views typical of Pittsburg and the engineer's profession. Among the illustrations were a view of Pittsburg, with "The Point" in the foreground, a blast furnace, the old "bock house," one of Pittsburg's landmarks, that is about a century and a half old, the Pittsburg Carnegie Library, and several scenes connected with iron works.

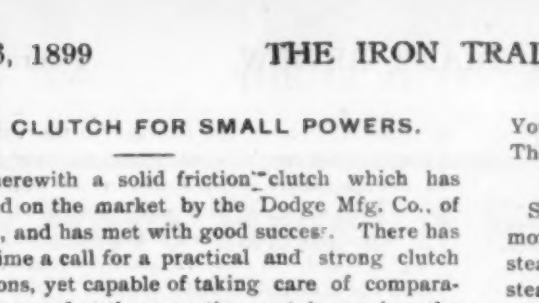
Rigid fingers of wood or iron on shipper bars for shipping the belt from the loose to the tight pulley, or vice versa, especially if the shipping is frequent soon injure the edges of the belt. Something that will turn freely, as, for instance, sleeves with ball bearings mounted on a rigid central pin, like the pedals on a bicycle crank, is a good device for the purpose—and somebody has actually recently obtained a patent on it.—[American Machinist.

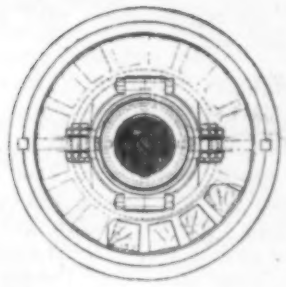
The association composed of manufacturers of iron pumps, whose meeting of a few weeks ago in Cleveland was referred to in these columns, met in Chicago, Feb. 9. The matters under consideration in Cleveland were further discussed and, in view of the unprofitable operation of many plants in the past year or two and the recent advances in materials, it was decided to make an advance in the price of pumps. The officers elected are: President, S. S. Gould, of Seneca Falls, N. Y.; vice-president, W. F. Deming, of Salem, O.; secretary and treasurer, E. H. Sleight, of Moline, Ill.

FRICTION CLUTCH FOR SMALL POWERS.

We illustrate herewith a solid friction clutch which has lately been placed on the market by the Dodge Mfg. Co., of Mishawaka, Ind., and has met with good success. There has been for a long time a call for a practical and strong clutch of small dimensions, yet capable of taking care of comparatively large powers, and at the same time not increasing the cost of installation. The Orton clutch, which is shown, has been designed to include these features, which belong to an efficient clutch of cut off coupling. It is so constructed as to be entirely self-contained; that is, it will take its full clamping or friction power without moving either shafting or pulleys. The efficiency of the multiple friction plates will be readily understood. It is to be noted that the pressure brought to bear on the first plate is transmitted to the second, then to the third, etc., and as all are drivers and splined to the main driving hub, twice the power is derived from the two plates which would be realized from one. The clutch is always in balance and can be operated at any speed, or can be used on countershafts where reverse motion is required, as a duplex clutch. It is made to transmit from two to 50 h. p. The illustrations show the complete Orton clutch, vertical and horizontal sections indicating the construction and dimensions, and a view of the clutch on a pulley.







ORTON FRICTION CLUTCH FOR SMALL POWERS.

An Idle Bessemer Steel Plant Leased.

President Henry Wick and Secretary Wm. H. Baldwin of the Ohio Steel Co., Youngstown, negotiated a one-year lease, last week, of the Columbia Iron & Steel Works, at Uniontown, Pa. At the same time they looked over coal lands about Uniontown and closed for 1,250 acres of coking coal property. The Columbia Iron & Steel Works were built in 1886-7 and were started in the fall of 1887. They have two five-ton Bessemer converters, two soaking pits, four heating furnaces, one 32-inch blooming mill and one 26-inch and one 18-inch train of finishing rolls. The product was blooms, billets, slabs, beams, channels, angles, tees, bars and special shapes for structural and engineering purposes. The plant has not been operated since 1893. It was purchased at sheriff's sale by the Safe Deposit & Trust Co., of Pittsburg, as trustee for the first mortgage bondholders. Among the original owners were A. M. Byers, A. W. Pollock, and Emil Winter, of Pittsburg, and Judge John K. Ewing, Judge Nathaniel Ewing, James A. Searight and W. H. Playford, of Uniontown. The Youngstown lessees have the privilege of purchasing the mill. They do not announce their plans as yet.

SIXTEEN vessels are now in course of construction at Baltimore. This number is larger than at any previous time since steam supplanted sail. The shipyards are building five large steamers, five tugs, five torpedo boats and one fishing steamer. Baltimore has long been running nip and tuck with Boston as the second port on the Atlantic coast, and at the present time she is on a par with the great shipbuilding cities on the coast or the great lakes. It is estimated that the contract price of these vessels now in hand will amount to $3,000,000.

THE American Steel Barge Co., of West Superior, Wis., has taken a contract from the Bessemer Steamship Co., to build two steel barges of 8,000 net tons capacity each. They are to be started next fall, and are to be out by the opening of navigation in 1900. They are to be 460 feet long, 50 feet beam, and 29.5 feet in depth. A third vessel, a steamship, to cost $300,000, will probably be let, it is reported, to F W. Wheeler, of Bay City. The vessels will cost in the neighborhood of $300,000 each.

A COKE region superintendent is thus quoted by the Connellsville, Pa., *Courier:* "It is commonly believed that more gas can be obtained for the burning of coal for the manufacture of by-product coke than seems to be actually got at by-product plants. At the Dunbar Furnace Co.'s plant it was thought that enough gas would be obtained to fire the entire boiler plant for the works, and I have heard it stated that there no more gas can be obtained than can be used under one battery of boilers."

IN connection with the modernizing of blast furnace plants, the installation of the Uehling method of casting and conveying metal has been steadily increasing, in view of the two years of experience with this device. The Riverside Iron Works, Wheeling, W. Va., are among the latest to do away with casting in sand. They have just taken out a license for the erection at their Benwood plant, of a Uehling standard double strand casting machine and conveyor of about 1,000 tons capacity a day. In the same district the Bellaire Steel Co. is installing the same machine, which is expected to be in operation in a short time.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Globe Brass & Iron Mfg. Co., Cleveland, has been incorporated with $10,000 capital stock.

The Bachman Foundry & Machine Co., of Austin, Tex., capital stock $20,000, has been incorporated by J. A. Bachman, Walter Tips, August Giesen and others.

It is announced that the Sieben Trap & Specialty Co., Kansas City, Mo., recently incorporated, will erect a factory and foundry, to cost about $15,000.

The C. F. McMurray Co., of Watervliet, N. Y., has been incorporated. The capital is $100,000 and the company will carry on the general founders and machinists' business. The directors for the first year are: J. J. Ranagan, of New York, and E. W. Ulman, and F. B. Kain, of Brooklyn.

The Steel Foundry Co. is being organized at Derby, Conn., to use a process for the "perfect liquefaction of steel," in the manufacture of small castings. Capital $100,000. Derby and New York capitalists are interested.

At Marshall, Mich., the Malleable Iron Works & Taylor Coupler Co., which is being organized with a capital of $20,000, asks the city for $5,000 and some land on which to erect a plant.

Alamo Iron Works, of San Antonio; capital stock, $75,000; incorporators, George F. Holmgreen, Julius H. Holmgreen and E. A. Holmgreen, is a new Texas corporation.

The Mason Machine Co., of Cleveland, has incorporated with $10,000 capital stock. W. J. Russell, David Crow, E. L. Thurston, Charles W. Whitmarsh, W. B. Whipple are the incorporators.

At Ansonia, Conn., Dana Bartholemew and W. H. Plumb have organized a new company and will engage in the manufacture of brass and other metal novelties.

It is reported that Peacock's Iron Works, Selma, Ala., will buy an engine lathe.

Bedford City, Va., contemplates buying a slow-speed engine to displace two high-speed engines now used.

M. W. Quinn, of the Quinn Mfg. Co., Petersburg, Va., is in the market for a second-hand lathe, eight-foot bed, nine-foot center; one gear-cutter, one small planer, one shaping machine and one upright drill, medium size.

For a new shop 70x80 feet, about to be built by the Vincennes Bridge Co., Vincennes, Ind., the equipment includes one boiler, one pump, one engine, lathes, drill presses, punches, shears, rolls, planers, etc.

New Construction:—

The Lukens Iron & Steel Co., manufacturer of steel and iron plates, of Coatesville, Pa., expect soon to begin work on a new plant of 10 open hearth steel furnaces of 50 tons capacity each. Possibly only half the number will be erected at once, and they will embody the most modern and complete equipment, with electric cranes, etc. The company will also erect a new 48-inch universal mill. The Lukens works now have two 30-ton and two 35-ton acid and two 35-ton basic furnaces and three trains of rolls, one of which is a three-high plate mill with rolls 120 x 34 inches.

The Baker Brothers, Foundry & Machine Works, Toledo, O., are making an addition to the foundry 110 feet long and 70 feet wide, besides additional cleaning rooms; also an addition 30 x 40 feet to the pattern shop. This makes a molding room 260 x 70 feet.

Wm. Tod & Co., Youngstown, O., have purchased land adjoining their plant and will use it as a machine shop site.

The new machine shop of the Kutztown (Pa.) Foundry & Machine Co., the greater part of whose works were destroyed by fire a few months ago, is now under roof. The pattern shop is also approaching completion.

The directors of the Pontiac, Mich., wheel factory have decided to begin at once on a building 254x150 feet.

Dietz, Schumacher & Boyl, of Cincinnati, are building an addition 160x90 feet, making the building 350x90 feet.

Fires and Accidents:—

At Trenton, N. J., fire at the works of the New Jersey Steel & Iron Co., Feb. 12, did damage to the extent of $40,000 to $50,000. The machine shop was entirely destroyed, as well as the machinery and patterns in the building. The blacksmith shop adjoining was partly destroyed.

A slip at the No. 2 stack of the Andrews & Hitchcock Iron Co., Hubbard, O., Feb. 12, partly wrecked the furnace and killed one man and injured several.

An explosion in the japanning department of the Baxter Stove Works, at Mansfield, O., Feb. 10, caused a fire loss of $100,000.

The Deere & Mansur Co.'s corn planter works foundry was partly burned, on Feb. 9, with a loss of $10,000, fully covered by insurance. ? ? ? ?

The foundry and machine shop of the Carlin Mfg. Co., Allegheny, Pa., were partly destroyed by fire Jan. 31. Loss, $25,000, insurance $15,000.

By a fire at Philadelphia, Feb. 3, the Philadelphia Novelty Co. lost $30,000; insurance, $10,000. Hoopes & Townsend, bolt, nut and screw works, lost $55,000, insured. De Kosenko Co., manufacturer of gas fixtures, lost $75,000; insured for $20,000. W. S. Cooper, manufacturer of plumbers' supplies, loses $150,000, insured. Fire started in the Cooper brass foundry.

The Manhattan Brass Co.'s plant, at New York, was burned Feb. 12; loss $250,000 on material, machinery and building.

Power Equipment and Machine Tools.

The Alabama Steel & Wire Co., Ensley City, Ala., awarded the contract for 14 boilers to the Stirling Co. The boilers will furnish 6,000 h. p. The machine shop of the plant is completed and is at work making 200 nail machines. Contracts for engines for the plant will be awarded soon.

The Cahall Sales Department, Bank of Commerce Bldg., Pittsburg, announces that owing to the rapid increase in the cost of materials, it has found it necessary to advance the prices of all boilers of their manufacture 20 per cent, the new prices going into effect March 1. This advance, it is explained, has been delayed as long as possible, in the hope that it might not be necessary, but materials continue to advance so sharply that the company is compelled to take this action.

The Brightman Machine Co., Millersburg, O., has closed another contract for 100 tons of shafting with a firm at Manchester, Eng. The company is kept busy with work for export trade.

The Shaw Electric Crane Co., Muskegon, Mich., has an order from the Pressed Steel Car Co., of Pittsburg, for 14 electric traveling cranes. They are of 7½ tons capacity each and will be installed at the Schoen plant.

The Snow Steam Pump Co., of Buffalo, reports several recent orders from Havana. The company is finishing its contract for the pumping machinery for a Russian battleship and a Russian cruiser and has a contract for pumps for the new Maine. Two large contracts for machinery for Japanese mining districts are being filled and contracts are on hand for a 15,000,000-gallon triple expansion engine for the Calumet & Hecla mine, and a 10,000,000-gallon pump for the Tidewater Pipe Line.

The creditors of the J. C. McNeil Co., boiler manufacturer, Akron, O., met in that city Feb. 8. Re-organization and sale of the plant were discussed, and it was decided to petition the common pleas court for an order for the sale of the property not sooner than May 1, and not later than June 1.

James A. Becher, of Mishawaka, has brought out a new expanding or opening screw cutting die head. A chief feature is the ease with which dies can be changed. A boy can do this, it is said, in one minute. The device closely approaches a universal screw cutting machine, and is adapted to the uses of manufacturers of bridges, bicycles, carriages, agricultural implements, wagons, steam engines, pulleos, radiators, clocks, electrical instruments, boilers, chandeliers, gas fixtures, plumbers' supplies, hardware specialties, etc. The inventor has made a contract with Haberle & Graham, of South Bend, Ind., to manufacture his device.

The Alabama Steel & Wire Co. has placed a contract with the Birmingham Machine & Foundry Co. for a cross-compound engine of 700 h.p. for its nail mill, now under construction at Ensley, Ala.

The Morton Mfg. Co., Muskegon, Mich., has been running

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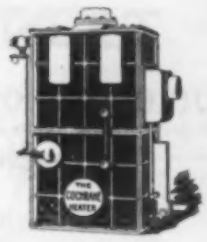

Harrison Safety Boiler Works, Col. Sta., Philadelphia, Pa.

day and night. A recently completed tool is a large shaper, on which the company has been at work for several months. At the Shaw Electric Crane Co.'s plant in the same city, a number of tools have been put in position in the new bridge department.

Boyts, Porter & Co., Connellsville, Pa., are very busy on mine pumps, and other special pumping machinery. Among orders recently taken is one for a double plunger pump for the Dunbar Furnace Co., with 30 inch steam cylinder, 36-inch stroke, and 20-inch plunger and having a daily capacity of over 2,000,000 gallons.

The Pittsburg District:—

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, has the contract for equipping the tin mill annealing furnaces of the Alcania Co.'s new mill with the Freeman patent furnace charger.

The Oliver Iron & Steel Co., Pittsburg, has completed an order for 7,000,000 carriage bolts and accompanying nuts for Hibbard, Spencer & Co., of Chicago. It will require 46 freight cars for the order. The sizes range from 3-16 inch to ¾ inch in diameter, and from ¾ of an inch to 12 inches in length. The order was for immediate delivery.

An execution for $4,229.84 has been issued in the case of John F. Miller against the Hercules Metal & Mfg. Co., Pittsburg.

The Carroll Porter Boiler & Tank Co., Pittsburg, has the contract to put down a pipe line, with pumps, tanks, etc., in connection with the recently discovered oil field in Australia. The pipe line will be 18 miles long, connecting the field with a shipping station. Last week the company sent 24 men to Australia to handle the work.

The American Steel & Wire Co. has received an order for about 1,000 miles of barb wire for Australia. Most of the wire has been apportioned to the Pittsburg mills of the company. The company has also secured an order for 10,000 kegs of wire nails and a large quantity of barb wire, to go to South Africa. The company is consolidating all its offices in the Pittsburg district in the Tradesmen's Bldg., Pittsburg. W. H. Rowe will be manager and Stephen Tener assistant manager.

William Clifford, Hussey Bldg., Pittsburg, who controls the Capel mine fan in the United States, has secured a contract for a ventilating fan to be placed at the top of a shaft 1,050 feet deep, extending to the center of the Hoosack tunnel. The fan is to be driven by electricity and if successful a larger fan will be installed, which will change the air in the tunnel, which is four and a half miles long, every half hour. The fan will be built by the Fort Pitt Bridge Works, Canonsburg. Mr. Clifford's intention to build a plant for the manufacture of these fans was mentioned in these columns last week. He recently received a contract from the Spring Valley Coal Co., for a fan to have a capacity of 150,000 feet of air a minute, and another from the Monongahela Gas Coal Co. for a fan having a capacity of 300,000 feet a minute. It was reported last week that the Pressed Steel Car Co. has purchased a large tract of land in lower Allegheny. The report was wholly unfounded, and was based only upon the recording of a deed last week for property purchased two years ago.

The strike of the riveters of the Pressed Steel Car Co., Pittsburg, against an increase in the requirements from 500 to 1,000 rivets a day is practically off. The company has made the required day's work 800 rivets and the old employes are returning to employment individually.

Within a few more weeks all the employes on the 14 mills of the W. D. Dewees Wood Co., at McKeesport, Pa., will be working but eight hours to the turn. The change has been under way for some time, one mill at a time going on the new arrangement. The crews on these mills formerly worked 12-hour turns, and two crews were enough for the full day. The triple turn plan has provided employment for more than 80 new men.

It is reported that a majority of the stock of the Old Meadow Rolling Mill Co., Scottdale, Pa., has been purchased by I. W. Frank, of the Frank-Kneeland Foundry & Machine Co., Pittsburg, and four associates. This, it is stated, will end the strike, the new controlling interest having arranged to pay the scale.

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The Frank-Kneeland Machine Co., of Pittsburg, has a contract for the erection of a new finishing department, to cost nearly a million dollars, for the National Enameling & Stamping Co., at St. Louis. The plant will consist of 22 sheet mills and all necessary appliances. It will have compound condensing engines, water tube boilers, electric traveling cranes, electric surface roads and electrically driven machinery. The buildings will cover nearly four acres.

General Industrial Notes:—

The Weimer Machine Works, Lebanon, Pa., are working to full capacity in all departments night and day. An order has been booked for a 200 cubic feet capacity cinder car for a furnace in England, besides lately completed shipments of cars to furnaces in England. The company has also secured an order from the Stewart Iron Co, Ltd., Sharon Pa., for a Weimer blowing engine, having a 50-inch diameter steam cylinder, 96-inch diameter blowing cylinder, with a stroke of 60 inches, to be of the poppet valve type, fitted with patent cut-off governor.

The West Duluth Furnace of the Duluth Iron & Steel Co., Duluth, Minn., is under option for lease and with it considerably more land for additional works. If the plant is taken it will be enlarged.

The formal transfer has been made by Reese, Hammond & Co. to the Reese-Hammond Fire Brick Co., of the fire brick plant in Fairfield tp., Westmoreland county, Pa., for $68,000. The works will be enlarged.

A Bridgeport, O., dispatch says that John A. Topping, president of the Ætna-Standard Iron & Steel Co., has issued a circular to the stockholders to the effect that the majority of the stock had been secured by the Moore syndicate, an affiliated interest of the American Tin Plate Co.

The Lloyd Booth Co., Youngstown, O., has an order from the Corning Iron & Steel Co., of Chicago, for a sheet mill.

In connection with the consolidation of the car companies, it is known that the manager of what will be the Michigan-Peninsular branch will be George Hargreaves, who is also the Detroit representative on the board of directors of the combined companies. The Michigan-Peninsular Car Co. will be put into the combination at an approximate valuation of $8,000,000. The net earnings of the company were $850,000 last year, and the profits for 1899 have been estimated at $1,000,000.

The Boston Elevated Railway Co. has awarded contracts to the A. & P. Roberts Co., Pencoyd, Pa., for the construction of elevated structures, calling for 8,200 tons of metal.

The Lloyd Booth Co., Youngstown, has been running its plant day and night recently. Among orders now being filled is one for two 250-ton metal mixers for the Ohio Steel Co. One will be completed this month and the other in the latter part of March. The company is shipping a large hot bed for the same company. The total length is 150 feet, and the weight 75 tons. Another big order is for an 18-inch continuous sheet mill, with tables and other connections, for the Aetna-Standard Iron & Steel Co., of Mingo Junction, O.

At the plant of the Brown Bonnell Iron Co., Youngstown, O., all the mills are in operation except the 18-inch Williams bar mill, which was wrecked by the bursting of a flywheel about a month ago. It will require another month to repair the damage. The company is discussing the building of a blast furnace. Meantime, Sharpsville Furnace, Sharpsville, Pa., will be operated under lease.

The Marinette Iron Works, of Marinette, Wis., have been sold for $16,000 to T. C. Miller, trustee for the bondholders. It is expected the plant will be leased to the D. C. Prescott Co.

The Ohio-Falls Iron Works, New Albany, were sold Feb. 7 to the Cleveland Steel & Iron Mfg. Co., of Cleveland. They have been idle for five years. The product is bridge, bar, plow and staybolt iron.

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The Aetna Foundry & Machine Co, of Springfield, Ill., which recently purchased the plant of the Barker Mine Car & Foundry Co, has one of the best equipped plants in Central Illinois. The officers recently elected are: Geo. N. Black, president; Herman Pierik, vice-president; J. D. Shaffer, secretary and treasurer; Edwin F. Smith, manager.

It is reported that the Wire Novelty Works, of New Castle, Pa., will be removed to Sharpsville, where citizens will take $30,000 in stock.

The Sharpsville Foundry & Machine Co., Sharpsville, Pa., has passed into the hands of a receiver, and will be sold at public auction March 4, including real estate, fixtures and shop. James P. Whitla, of Sharon, is named as receiver.

The three Thew automatic steam shovels built for the Lorain Steel Co. by the Thew Steam Shovel Co., Cleveland, the work being done at the Variety Iron Works, Cleveland, have been delivered to the ore yards of the Lorain Steel Co., at Lorain.

Tests of lignite coal as fuel in making pig iron have just been made at the Rusk, Tex., penitentiary blast furnace, and have proved successful. Fifty per cent of lignite and 50 per cent charcoal were first used, and the amount of lignite was gradually increased until 100 per cent was used. Although the furnace was not in good order, the lignite made iron, it is said, of as good quality and as much per ton as has been obtained with charcoal.

Thirty-eight carloads of wire products were shipped from the Waukegan plant of the American Steel & Wire Co. on a recent day, a record that has been equaled in only a few cases

The Newburgh (N. Y.) Wire & Nail Co.'s plant will be sold at auction March 23, under proceedings by the bondholders. The company was formed by the re-organization of the old Kilmer company. There were then outstanding $30,000 of first mortgage bonds, $40,000 of second and $85,000 of third, besides which there was a fourth or first consolidated mortgage bond issue. It is understood the holders of the first series have been offered 100 cents on the dollar, second 85 cents and third 12½ cents, or about $75,000 for the entire outstanding bonded indebtedness.

It is reported that Newcomerstown, O., will issue $15,000 bonds to secure a pipe works employing 300 men.

The McCook Tube Works, at Beaver Falls, Pa., have been closed down recently on account of scarcity of gas.

The Excelsior Foundry Co., Bay City, Mich, has elected the following officers for the year: President, B. Boutell; vice-president and superintendent, Charles T. Wilks; secretary and treasurer, Walter H Lefever.

The United States Mitis Co. has brought suit for royalty and injunction against the Indiana Steel Casting Co., Montpelier, Ind.

The Wetherald Rolling Mill Co, Frankton, Ind., will build four more heating furnaces.

Goodwin & Kintz, manufacturers of brass fittings at Shelton, Conn., will remove their business to Winsted, Conn.

D. M. Hills, of Chicago, is negotiating for the starting of the rolling mill at Muskegon, Mich.

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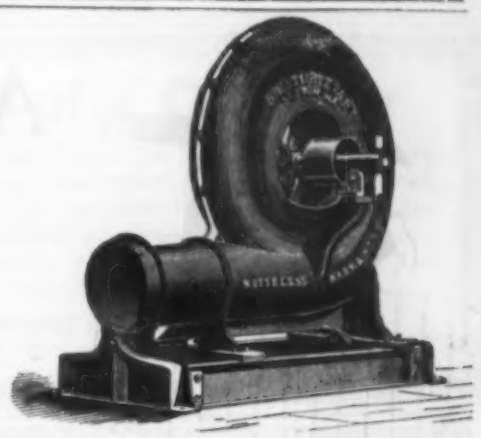

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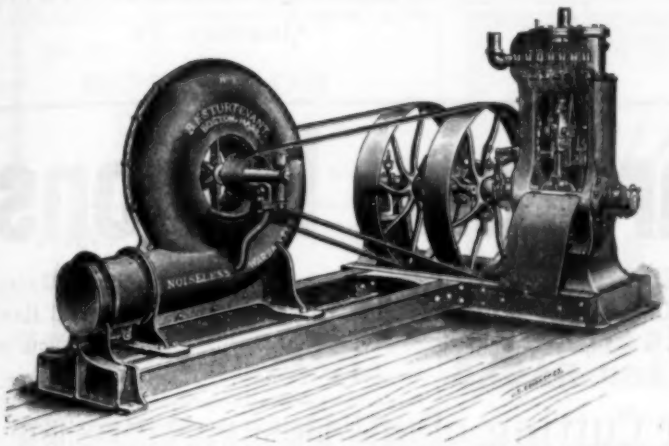

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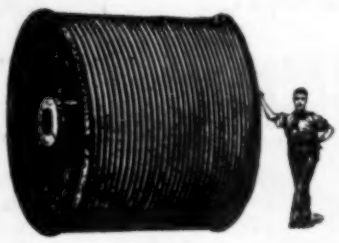

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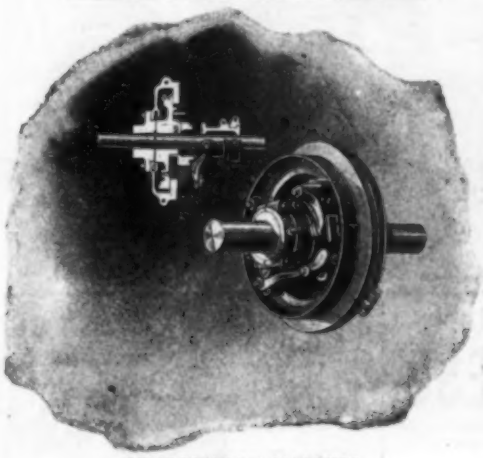

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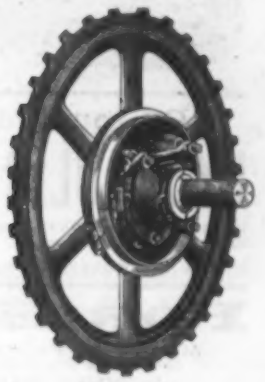

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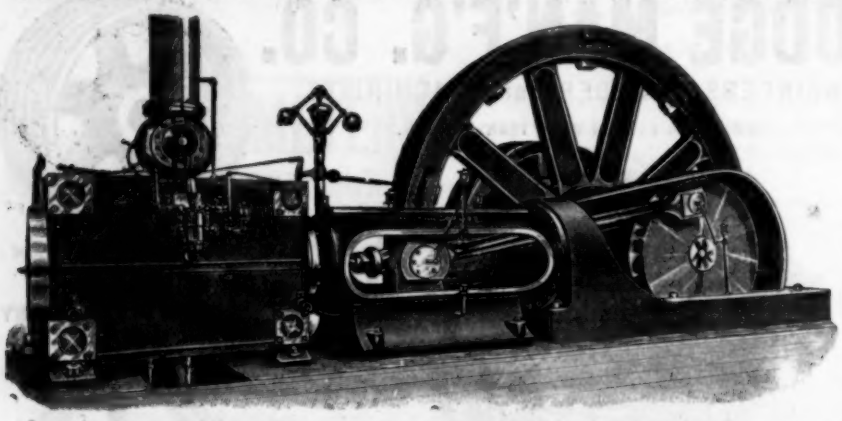

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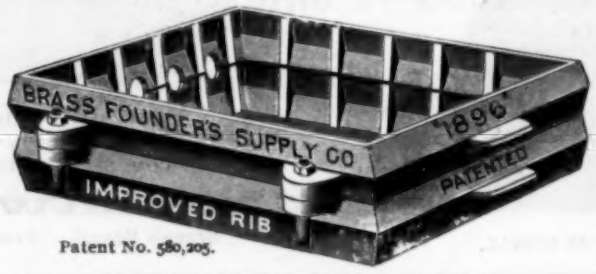

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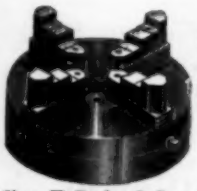

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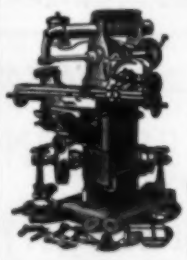

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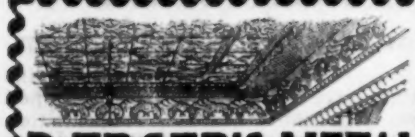

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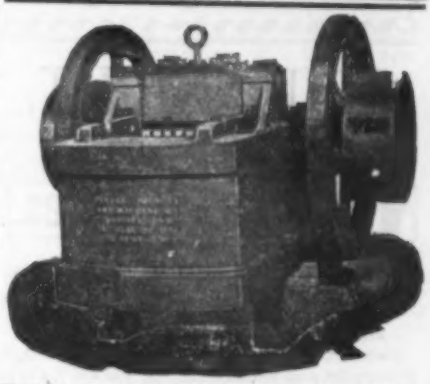

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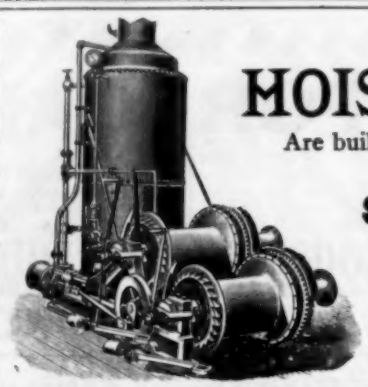

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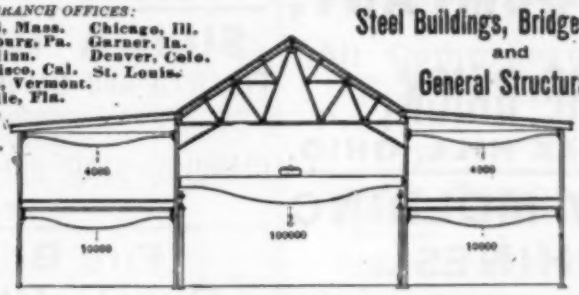

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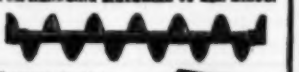

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The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

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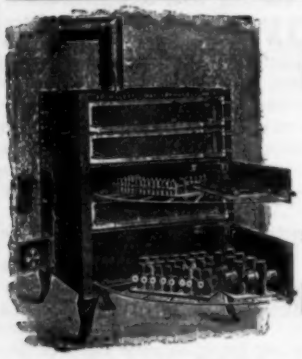

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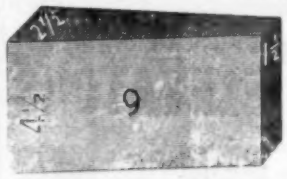

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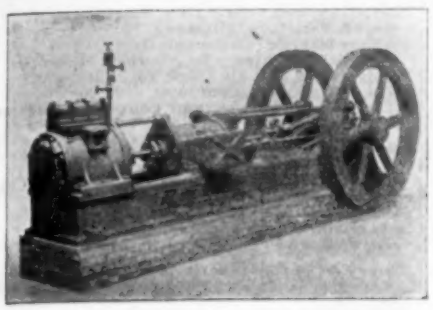

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Channelers—
The Ingersoll-Sergeant Drill Co., New York.

Charcoal—(Lump, powdered, granulated)—
The S. Obermayer Co., Cincinnati, O.

Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
The R. W. Hunt & Co., Chicago, Ill.
Wellman Seaver Co., Cleveland, O.
Benedict Crowell, Cleveland, O.
John T. Jones & Co., Chicago, Ill.
J. Blodgett Britton & Co., Warrenton, Va.

Chilled and Sand Rolls—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Chucks—
Skinner Chuck Co., New Britain, Conn.
Massey Vise Co., Chicago, Ill.

Coal Cutters—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.

Coal Screens—
Rob't. Aitchinson Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Coal and Coke—
Forster, Waterbury & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Washington Coal and Coke Co., Pittsburg, Pa.

Coal Mining Machinery—
Jeffrey Mfg. Co., Columbus, O.

Conveyors—
Jeffrey Mfg. Co., Columbus,O.
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Comparometers—
Vulcan Mfg. Co., Pittsburg, Pa.

Compressed Air Shop Tools—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Compression Couplings—
Geo. B. Sennett Co., Youngstown, O.
The Aultman Co., Canton, O.

Core Ovens—
Millett Core Oven Co., Brightwood, Mass.

Corrugated Iron—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
Edwin Harrington, Son & Co., Philadelphia.
Wellman-Seaver Engineering Co., Cleveland, O.
Reading Crane & Hoist Works, Reading, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

Crucibles—
The S. Obermayer Co., Cincinnati, O.

Cupolas—
The S. Obermayer Co., Cincinnati, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

Drill Grinders—
J. Wendell Cole, Columbus, O.

Drill Presses—
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Fox Machine Co., Grand Rapids, Mich.
Bickford Drill & Tool Co., Cincinnati, O.
Cleveland Tool & Supply co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

Drop Forgings—
Wyman & Gordon, Worcester, Mass.

Drop Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Fox Machine Co., Grand Rapids, Mich.
Long & Allstatter Co., Hamilton, O.
E. Konigslow & Bro., Cleveland, O.

Drop Hammers—
Baush & Harris Machine Tool Co., Springfield, Mass.

Dry Kilns—
B. F. Sturtevant Co., Boston.

Dynamos—
Jeffrey Mfg. Co., Columbus, O.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.

Elevators—
The Lane & Bodley Co., Cincinnati, O.

Elevating and Conveying Machinery—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
The Hanson & Van Winkle Co., Newark, Chicago, New York.
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O.
Vitrified Wheel Co., Westfield, Mass.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
The Hanson & Van Winkle Co., Newark, Chicago, New York
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O.

Engineers and Contractors—
Wellman Seaver Engineering Co., Cleveland.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville Ohio.
E. E. Erickson, Pittsburg, Pa.
Benedict Crowell, Cleveland, O.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.

Engine Packing—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Engine Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington & Son Co., Philadelphia

Engines (Oil)—
The Aultman Co., Canton, O.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co,, Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
Lane & Bodley Co., Cincinnati, O.
Geo. B. Sennett Co., Youngstown, O.
The Aultman Co., Canton, O.

Engravers and Electrotypers—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.
Eclipse Electrotype & Eng. Co., Cleveland, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
American Gas Furnace Co., New York City.
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield,
Dover Fire Brick Co., Cleveland. Pa.
Diamond Fire Brick Works, Akron, O.
F. B. Stevens, Detroit, Mich.
The S. Obermayer Co., Cincinnati, O.
Chicago Fire Clay Product Co., Chicago, Ill.
Columbia Fire Clay Co., Cleveland, O.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flexible Shafts—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Fluor Spar
James Irwin & Co., Pittsburg, Pa.

Foot and Power Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.

Foundries—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Geo. B. Sennett Co., Youngstown, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.

Foundry Equipments—
The S. Obermayer Co., Cincinnati, O.

Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Heber Wells, New York City.
Millett Core Oven Co., Brightwood, Mass.
Hanson McDowell, Chicago, Ill.
Cleveland Facing Mill Co., Cleveland, O.
The S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
James Irwin & Co., Pittsburg, Pa.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Columbia Fire Clay Co., Cleveland, O.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Diamond Fire Brick Works, Akron, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Foundry Facings—
The S. Obermayer Co., Cincinnati, O.
Cleveland Facing Mill Co., Cleveland, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Iron Co., South Bethlehem, Pa.
Bræburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.

Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, New York.
Swarts Metal Refining Co., Chicago, Ill.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City
American Gas Furnace Co., New York City.

Galvanized Iron—
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizers—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizing Pots—
Wm. B. Pollock & Co., Youngstown, O.

Gas Burners—
American Gas Furnace Co., New York City.

Gas Furnaces—
American Gas Furnace Co., New York City.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.
Brainard Milling Machine Co., Hyde Park, Mass.
The Van Dorn & Dutton Co., Cleveland, O.

Gear Cutters—
Brainard Milling Machine Co., Hyde Park, Mass.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.

Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Brass Founders' Supply Co., Newark, N. J.

Hack Saws—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

Hangers—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.

Harness Snaps—
Covert Mfg. Co., West Troy, N. Y.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Heating and Ventilating Apparatus
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill
Parkhurst & Wilkinson Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Horse Shoes—
Phoenix Horse Shoe Co., Joliett, Ill.

Hotels—
United States Hotel Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa
Pittsburg Bridge Co., Pittsburg, Pa.
Riter-Conely Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill
E. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.

Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
The F. B. Shuster Co., New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Chicago Die and Machine Works, Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

Ladles—
The S. Obermayer Co., Cincinnati, O.

Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Bickford Drill & Tool Co., Cincinnati, O.

Machinery Name Plates—
August Becker, Boston, Mass.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Machinists' Vises—
Massey Vise Co., Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill

Manufacturing Chemists—
James Irwin & Co., Pittsburg, Pa.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y
C. H. Besly & Co., Chicago, Ill.

Milling Machines—
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.

Mining Machinery—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.

Mine Pumps—
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.

Molding Sand—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Molders' Tools—
The S. Obermayer Co., Cincinnati, O.

Name Plates—
August Becker, Boston, Mass.

Nickel Plating Outfits—
The Hanson & Van Winkle Co., Newark, Chicago, New York.
Northampton Emery Wheel Co., Chicago, Ill.

Nuts and Bolts
Rockford Bolt Works, Rockford, Ill.
Upson Nut Co., Cleveland, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.
C. H. Besly & Co., Chicago, Ill.

Oil Burners—
W. S. Rockwell & Co., New York City.
American Gas Furnace Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Ore Screens—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.

Packing—
C. H. Besly & Co., Chicago, Ill
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York, City.

Pattern Letters—
Heber Wells, New York City.

Pattern Makers' Vises—
Massey Vise Co., Chicago, Ill.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.

Pig Iron—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Hickman & Williams, Chicago, Ill.
Shenango Valley Steel Co., New Castle, Pa.
Spearman Iron Co., Sharpsville, Pa.
Salisbury Carbonate Iron Co., New York City.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Pipe Cutting and Threading Machines—
The Armstrong Mfg. Co., Bridgeport, Conn.

Planers—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.

Planer Chucks—
Massey Vise Co., Chicago, Ill.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbago—
The S. Obermayer Co., Cincinnati, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Pneumatic Tools—
American Pneumatic Tool Co., New York City

Portable Forge—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.

Power Drop Hammers—
Baush & Harris Machine Tool Co., Springfield Mass.

Power Presses—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
The Long & Allstatter Co., Hamilton, O.
E. Konigslow & Bro. Cleveland, O.

Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.

Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
The Long & Allstatter Co., Hamilton, O.
E. Konigslow & Bro. Cleveland, O.

Pressure Gauges—
The Bristol Co., Waterbury, Conn.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.

Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.
Hall Steam Pump Co., Pittsburg, Pa.

Punches—
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.
E. Konigslow & Bro. Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa
Uehling, Steinbart & Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.

Rivets—
Champion Rivet Co., Cleveland, O.

Riveted Steel Pipe—
Wm. B. Pollock & Co. Youngstown, O.

Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Roofs—
Shiffler Bridge Co., Pittsburg
Berlin Iron Bridge Co., East Berlin, Conn.
Pittsburg Bridge Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Sand—
David Tod Sand Co., Youngstown, O

Sand and Chill Roll—
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland, O.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill
Rockford Bolt Works, Rockford, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.

Shapers—
Baush & Harris Machine Tool Co., Springfield, Mass.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.

Ship Yards—
Wm. Cramp & Sons, Philadelphia, Pa.

Special Machinery—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill.
A. H. Nilson Machine Co., Bridgeport, Conn.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.

Stand Pipes—
Wm. B. Pollock & Co., Youngstown, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill.

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Pumps—
Hall Steam Pump Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vail Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.

Steam Shovels and Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Otis Steel Co., Cleveland, O.
Miller, Wagoner, Fieser & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.

Steel Castings—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Hanson McDowell, Chicago, Ill.

Steel Plants—
Wm. B. Pollock & Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

Steel Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
Shenango Valley Steel Co., New Castle, Pa.
The Lorain Steel Co., Lorain, O.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O.

Semi-Steel—
Hanson McDowell, Chicago, Ill.

Stokers—
Playford Stoker Co., Cleveland, O.

Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. B. Pollock & Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

Tank Cars—
Wm. B. Pollock & Co., Youngstown, O.

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.

Transmission Machinery—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

Tubes—
National Tube Works, McKeesport, Pa.

Tube Welding—
S. Fix Sons, Cleveland, O.

Tumbling Mills—
The S. Obermayer Co., Cincinnati, O.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Twist Drill Cases—
Vulcan Mfg. Co., Pittsburg, Pa.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Vises—
Massey Vise Co., Chicago, Ill.

Wire Machinery—
The F. B. Shuster Co., New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.
A. H. Nilson Machine Co., Bridgeport, Conn.

Wire Nails—
Cleveland Rolling Mill Co., Cleveland, O.
Shenango Valley Steel Co., New Castle, Pa.

Wood Pulleys—
Dodge Mfg. Co., Mishawaka, Ind.

Wrought Pipe—
National Tube Works, McKeesport, Pa.

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BRÆBURN STEEL COMPANY, Bræburn, Pa.
MANUFACTURERS OF
FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

DIRECTORS:
Wm. Metcalf,
Chas. Metcalf,
P. B. Hasbrouck.
R. P. Kelly,
Sec'y. and Treas.

MORE WEAR from your tools
.....Almost no **STEEL EXPENSE**
NO TROUBLE

"It pays to use the most reliable tool steel in the market."

SANDERSON BROS. STEEL CO.
Cleveland Warehouse, 97 Water St.

CRESCENT STEEL
ESTABLISHED 1865 INCORPORATED 1889.
CRESCENT STEEL CO.
480 PEARL ST. NEW YORK PITTSBURGH, PA. 64 & 66 S. CLINTON ST. CHICAGO.

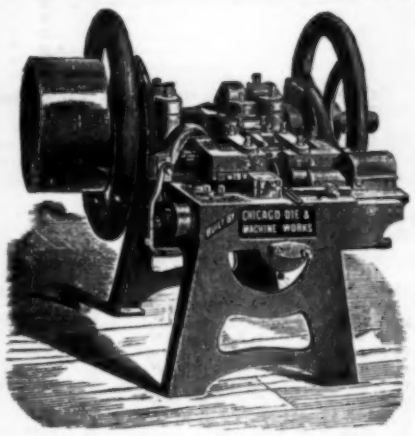
La BELLE STEEL CO., Pittsburgh, Pa.
MANUFACTURERS OF FINE
CRUCIBLE CAST TOOL STEEL.
SPECIAL GRADES FOR ALL PURPOSES.
BYRON H. WHITE,
Western Selling Agent.
OFFICE AND WAREHOUSE: **68 and 70 South Canal St., Chicago.**

COLD DRAWN
SHAFTING
FITZSIMONS & CO. CLEVELAND, OHIO
BYRON H. WHITE WESTERN SELLING AGENT
WAREHOUSE & OFFICE 68-70 SO. CANAL ST. CHICAGO

BYRON H. WHITE, Western Selling Agent,
68-70 South Canal St., Chicago.

THE MORRIS & BAILEY STEEL CO.
COLD ROLLED STRIP STEEL
FLAT & COILED FOR STAMPING BLANKING DRAWING SPRINGS ETC
WAREHOUSE & OFFICE 68 70 S CANAL ST CHICAGO
BYRON H WHITE
PITTSBURG, PA

BYRON H. WHITE, Western Selling Agent, CHICAGO.



CHICAGO DIE AND MACHINE WORKS
MANUFACTURERS OF
Bolt Forging Machines
NUT TAPPERS, IRON CUTTERS,
Power, Screw and Lever Presses, Dies.
Furnaces for Heating Ends of Iron for Bolts.
SPECIAL MACHINERY
87 to 91 West Lake St., Chicago.

Don't Waste Money in Your Pattern Shop.
THE GOBEILLE PATTERN CO., Cleveland.

Between the Lakes and the Gulf, the Mississippi and the Allegheny Mountains—the best buying section of the United States—is the BULK of THE IRON TRADE REVIEW'S circulation. In this section advertisers in all trade papers get best returns.

IRON AND STEEL MARKETS.

IRON ORE.

(On Lake Erie docks.)

Special low-phosphorus hard Ore, Bessemer	3.65
No. 1 Specular, Bessemer	3.01@3.35
No. 1 Bessemer hematite	2.75@3.15
Hematites No. 1 non-Bessemer	1.90@2.10
No 1. Specular, non-Bessemer	2.00@2.40
Mesabi Bessemer	1.80@2.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	12 25
No. 1 Strong Foundry	11 00@11 25
No. 2 Strong Foundry	10 50@10 75
Gray Forge, red short	10 50
Gray Forge, neutral	10 25
No. 1 American Scotch	11 15@11 40
No. 2 American Scotch	10 65@10 90
Lake Superior Charcoal	11 50@12 00
PITTSBURG:	
No. 1 Foundry	$11 00@11 30
No. 2 Foundry	10 50@10 60
Gray Forge	9 75@9 85
White and Mottled	9 50
Warm Blast Charcoal	13 00@13 50
Cold Blast Charcoal	22 00@26 00
Bessemer	11 15
CHICAGO:	
Lake Superior Charcoal	$11 50@13 00
Local Coke Foundry No. 1	11 50@12 00
Local Coke Foundry No. 2	11 00@11 50
Local Coke Foundry No. 3	10 75@11 00
Local Scotch Foundry No. 1	11 50@12 00
Local Scotch Foundry No. 2	11 00@11 50
Local Scotch Foundry No. 3	10 75@11 00
Southern Coke No. 1	@10 85
Southern Coke No. 2	@10 60
Southern Coke No. 3	@10 10
Southern No. 1 Soft	@10 80
Southern No. 2 Soft	@10 65
Southern Silveries	11 25@11 50
Jackson Co. Silveries	12 50@14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@12 50
Alabama Car Wheel	15 00@16 00
Malleable Bessemer	11 50@12 00
Coke Bessemer	11 50@12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$@10 50
Southern Coke No. 2 and No. 1 Soft	@10 25
Hanging Rock Coke, No 1	@11 00
Hanging Rock Charcoal No. 1, Fdy	15 50@16 00
Tennessee Charcoal No 1	14 00@14 25
Jackson County Silvery No 1	12 50@12 75
Southern Coke, Gray Forge	@9 25
" " Mottled	@9 25
Standard Georgia Car Wheel	14 25@1500
Tennessee " "	13 00@14 00
Lake Superior " "	14 25@14 50
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	11 00@11 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 50@11 75
Ohio Strong Softener No. 1	11 50@11 75
Jackson Co. Silvery No. 1	@14 00
Lake Superior Charcoal	12 00@12 50
Southern Soft No. 1	@12 25
" " No. 2	@12 00
ST. LOUIS:	
Southern Coke No 1	$@$10 90
Southern Coke No. 2	@10 25
Southern Coke No. 3	@9 75
Southern Gray Forge	@9 25
Southern Charcoal No. 1	@10 50
Missouri Bessemer	@13 00
Lake Superior Car Wheel	@13 00
Ohio Softeners	@14 00
Southern Car Wheel	@15 00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons
Old iron rails	$14 00
Old steel rails (6 ft. and over)	9 75
Old steel rails (6 ft. and under)	9 75
Old car wheels	11 00
	Net Tons
No. 1 R. R. wrought scrap	$11 50
Mill scrap	8 50
No. 1 Machine cast scrap	8 25
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	7 00
Cast borings	5 50
Uncut wrought iron boilers	5 00
Steel boiler plates	8 00
Grate bars	5 50
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	7 50
Sheet iron	5 25
Wrought drillings	6 50
Malleable iron	8 50

STRUCTURAL MATERIAL.

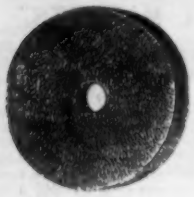
Beams and Channels (f. o. b. Cleveland)	1.40c
Angles	1.30c
Tees	1.40c
Universal Plates	1.40@1.45c
Sheared Plates	1.45c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.05 Base.
2 to 2¾	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
5⅛ to 6½	"



VITRIFIED EMERY AND CORUNDUM WHEELS. . .

FOR

Foundry and Machine Shop Work.

SOLD BY
Weed & Co., Buffalo, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
Machinist Supply Co., Chicago, Ill.
Sligo Iron Store Co., St. Louis, Mo.

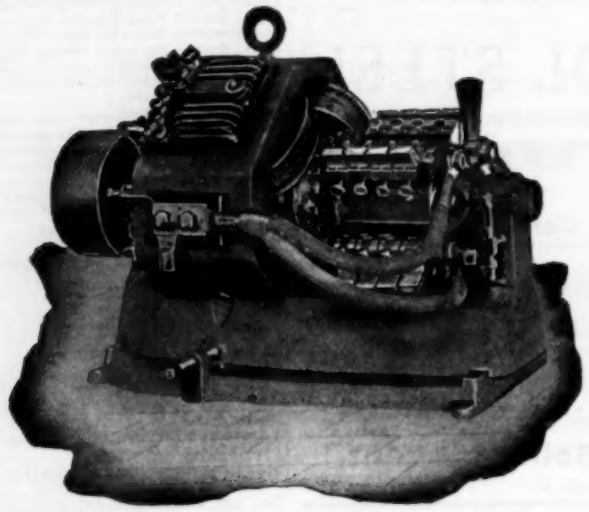
CAN BE RUN WET OR DRY.

VITRIFIED EMERY WHEEL CO.,
Westfield, Mass.

Eddy Dynamo Electro-Plating Machines

FOR

BICYCLE PLATING PLANTS.



NORTHAMPTON EMERY WHEEL CO., 20 S. Canal St., Chicago, Ill.

EXCLUSIVE WESTERN SELLING AGENTS.

PIONEERS LEADERS

LOW SPEED DYNAMOS. NICKEL ANODES. LACQUERS.

NICKEL PLATING OUTFITS

BUFFS. CYANIDE POTASH. TURKISH EMERY. POLISHING MACHINERY.

THE HANSON & VAN WINKLE CO.

NEWARK CHICAGO NEW YORK

Metallurgy of Cast Iron, Price $3.00.

6⅝ to 7¼	2.50	extra
⅜ to ⅞	.10	"
⅞ to 11-16	.20	"
⅝ to 9-16	.30	"
7-16 to 15-32	.40	"
⅜ to 13 2	.50	"
5-16 to 32	.70	"
¼ to 9-32	.90	"
7-32	1.40	"
3-16	2.50	"

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05	Base
4½ 0 6 x ⅜ to 1	.10	extra
6½ 0 8 x ⅜ to 1	.60	"
8½ 0 10 x ⅜ to 1	.80	"
1½ 0 4 x 1 1-16 to 1½	.30	"
4½ to 6 x 1 1-16 to 1½	.40	"
6½ to 8 x 1 1-16 to 1½	.60	"
8½ to 10 x 1 1-16 to 1½	.90	"
2 to 4 x 1⅝ to 2	.50	"
4½ to 6 x 1⅝ to 2	.60	"
6½ to 8 x 1⅝ to 2	.80	"
8½ to 10 x 1⅝ to 2	1.00	"
2 to 4 x 2⅛ to 3	.60	"
4½ to 6 x 2⅛ to 3	.80	"
6½ to 8 x 2⅛ to 3	1.00	"
1⅜ to 1⅝ x ⅜ to 1	.10	"
1 to 1 1-16 x ⅜ to ⅝	.20	"
⅝ to 15-16 x ⅜ to ⅝	.40	"
⅝ to 11-16 x ⅜ to ⅝	.50	"
⅝ to 9-16 x ⅜ to ⅝	.90	"

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70	extra.
6¼ to 6¾ x ¼ to 5-16	.50	"
4½ to 6 x ¼ to 5-16	.30	"
1½ to 4 x ¼ to 5-16	.20	"
1 to 1¾ x ¼ to 5-16	.30	"
⅝ to 15-16 x ¼ to 5-16	.50	"
⅜ to 11-16 x ¼ to 5-16	.80	"
⅛ to 9-16 x ¼ to 5-16	1.00	"
⅜ to 7-16 x ¼ to 5-16	1.50	"

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90	extra
7 to 8 x Nos. 10, 11 and 12	1.00	"
6¼ to 6¾ x No. 9 to 3-16	.70	"
6¼ to 6¾ x Nos. 10, 11 and 12	.80	"
4½ to 6 x No. 9 to 3-16	.50	"
4½ to 6 x Nos. 10, 11 and 12	.60	"
1½ to 4 x No. 9 to 3-16	.40	"
1½ to 4 x Nos. 10, 11 and 12	.50	"
1 to 1 3-16 x No. 9 to 3-16	.50	"
1 to 1 3-16 x Nos. 10, 11 and 12	.60	"
13-16 to ⅞ x No. 9 to 3-16	.60	"
13-16 to ⅞ x Nos. 10, 11 and 12	.70	"
11-16 to ¾ x No. 9 to 3-16	.80	"
11-16 to ¾ x Nos. 10, 11 and 12	.90	"
9-16 to ⅝ x No. 9 to 3-16	1.00	"
9-16 to ⅝ x Nos. 10, 11 and 12	1.10	"
7-16 to ½ x No. 9 to 3-16	1.30	"
7-16 to ½ x Nos. 10, 11 and 12	1.40	"
⅜ x No. 9 to 3-16	1.50	"
⅜ x Nos. 10, 11 and 12	1.60	"

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes o Light Bands.

Oval Iron.

⅞ to 1½	.40	extra.
¾ to 13-16	.50	"
⅝ to 11-16	.60	"
½ to 9-16	.80	"
⅜ to 7-16	1.10	"
½ to 9-16 x 3-16	1.00	"
⅜ to 11-16 x ⅛	1.20	"

Half Oval and Half Round.

2¼ to 3	.60	extra
⅞ to 2	.50	"
¾ to 13-16	.70	"
⅝ to 11-16	.90	"
½ to 9-16	1.20	"
⅜ to 7-16	2.50	"
5-16	3.50	"
¼	4.50	"

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

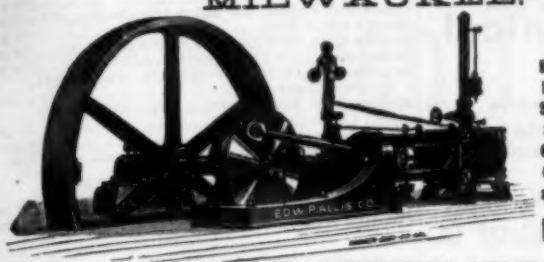
Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50	Base.
		Extras.	
1½ to 6,	" 10, 11, 12 or 5/16"	.05	per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3-16"	.10	"
1 to 1¾,	" 10, 11, 12 or 5/16"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or 5/16"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or 5/16"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or 5/16"	.45	"
½, Nos. 7, 8, 9 or 3-16"		.55	"
½, " 10, 11, 12 or 5/16"		.60	"
7-16 " 7, 8, 9 or 3-16"		.75	"
7-19 " 10, 11, 12 or 5/16"		.85	"
⅜, " 7, 8, 9 or 3-16"		.95	"
⅜, " 10, 11, 12 or 5/16"		1.05	"

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60	Base
		Extras.	
7-16 to 2,	" 17, 18, and 19	.05	per 100 lb
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1¼,	" 22	.25	"
½ to 1¼,	" 13, 14 and 15	.05	"
½ to 1¼,	" 16, 17 and 18	.20	"

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

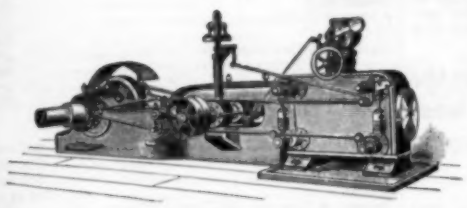
Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO. PITTSBURG.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



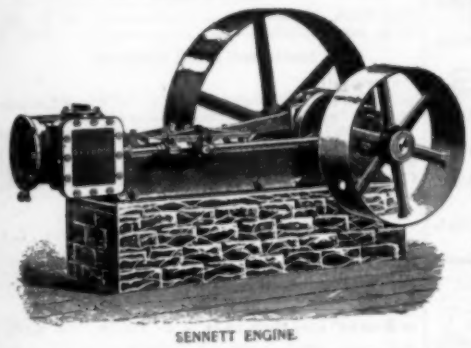
Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.



SENNETT ENGINE.

THE GEO. B. SENNETT CO.

YOUNGSTOWN, OHIO.

MANUFACTURERS OF THE

Sennett Slide Valve Engine.

A well made and durable center crank engine of from 20 to 40 H. P. The design is thoroughly modern and all parts are made in duplicate. Engines kept in stock ready to run. Catalogues or prices willingly furnished. Among our other specialties is the

Sennett Compression Couplings.

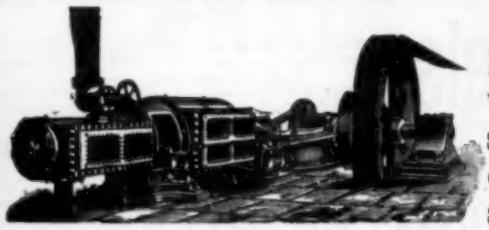
(See advertisement next week.)

Foundry contracts solicited for Castings from 10 lbs. to 5 tons each.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



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1⅛ to 1⅜,	"	19 and 20	per 100 lbs.
1¼ to 1⅜,	"	21	.20 "
1¼ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.13 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
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9-16,	"	19 and 20	.60 "
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9-16,	"	22	.80 "
9-16,	"	23	.90 "
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3/8,	"	16, 17 and 18	1.10 "
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English Tool Steel.

Jessop's	15½c
Hobson's " Best "	15½c
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Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
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Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ½ thick	.08

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Bessemer Machinery	base price, 1 40
Open-hearth Tire	" 1 45
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ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
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3⅛ to 4 in	.09½
⅝ to 11-16 and 4⅛	.10
⅝ to 6 in	10½
¼ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

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⅛, ⅜, 11-16 and ⅝ inches diameter	3 00
Bridge ⅛, ⅜, 11-16 and ⅝ inch diam	3 55

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Lap weld black, base, and 10 per cent	.78
Butt " " " "	.72
Lap " galv. " "	.70
Butt " " " "	.67
Boiler tubes 2¼" and smaller	72½
Boiler tubes 2¼" and larger	.75
Casting screw and socket joint	dis. 50
Casing inserted joint	dis. 45

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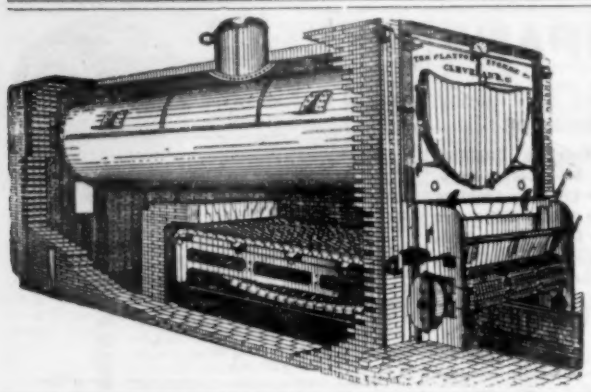
Blacksmiths'	Hill's	dis
	Bullock's	dis 30@12
Moulders'		dis 40@40@10
Hand		dis 40@10@50



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Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3¼
Iron, steel points	₩ lb 1

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1½"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F F. F
Kegs, ₩ lb	4¾c	5 c	2¾c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5¼c	3 c
10 lb cans, 10 in case	6 c	6¼c	c
10 lb cans less than 10	10 c	10 c	¼c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Crant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 50
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

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Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 2
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 55
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	10c
" " " " over 5 lbs	8c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅝	11⅛	8⅝	6	5⅛	5⅛	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ¼c., 1 lb boxes add 1c to list.

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Standard Penny Nails, ₩ keg, base.

Car lots	$1.30
Less than car lots	$1.40

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Zinc and Tin	dis 6
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Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10&10&15

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" 6 to 7 lbs	dis $13 60

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Rivets.

Iron, Thousand, list November 1, 1894	dis 60@60
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894	dis 60@65
Copper	dis 50@50&15

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@33
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

List, Apr. 9, 1894

Brass	dis 35
Copper	dis 35c
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30

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Time Table effective May 15th, 1898.
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Elyria Depot: Huron St., West Side.

South Bound.			Central Standard.		North Bound.	
15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria.....	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester.....	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:25	7:20	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester.....	7:29	10:49	6:19
6:52	3:35	8:30	Medina.....	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling.....	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport...	.....	6:05	1:40
.....	8:25	.....	Bellaire.....	.....	5:50	.....
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p m.

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Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
Akron, Canton & Marietta,...	†2:10 P M	†11:00 A M
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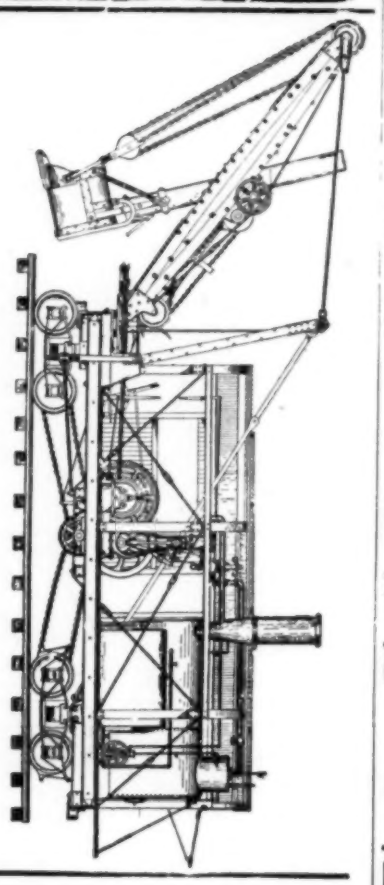

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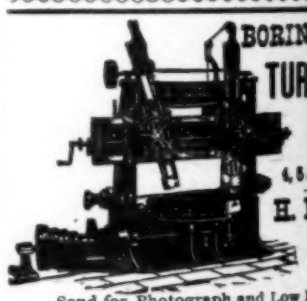

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